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FACTORY

MANAGEMENT AND MAINTENANCE

FEBRUARY 1948

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MANAGEMENT and MAINTENANCE

FEBRUARY, 1948

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FACTORY
MANAGEMENT AND MAINTENANCE

L. C. MORROW, EDITOR

IT WILL TAKE FACTS TO FIGHT ANTI-INDUSTRY PROPAGANDA

DEMANDS for a third round of wage increases are coming up. Once again labor's spotlights will be played on prices of manufactured products. Once again profits of manufacturing corporations will be held by union leaders to be the cause behind the wage demands. And in this election year the manufacturer will be the scapegoat for many a devious thought and damning conclusion.

Unfortunately there will be little information given in the press or elsewhere to show that influences other than the actions of management are at work to affect cost of living.

It is so easy for the propagandists to make statements about industry's "exhorbitant profits," the "high prices" of its products, its "slave-labor bill," and the like. The newspapers, of course, in verbatim reports, use these terms, with the result that even the best media for public information help exploit misleading epithets and statements. It is only the occasional editorial that analyzes them and presents the other side of the picture. The effect of this type of countermove is almost negligible.

Industry's Duty Is Plain

Under these conditions, the obligation of industrial management to acquaint its employees and its communities with facts has increased. In this year of 1948 industry will have to do twice as much to stay where it is in the minds of the public.

To stay where it is, is not enough. As FACTORY's most recent survey of worker opinion showed, workers still consider union leaders their real friends. I repeat what was said in our report of that survey: "Damaging misconceptions are still current, despite the best efforts of some managements to present clear, accurate pictures of industry's economic position."

Give This Kind of Information

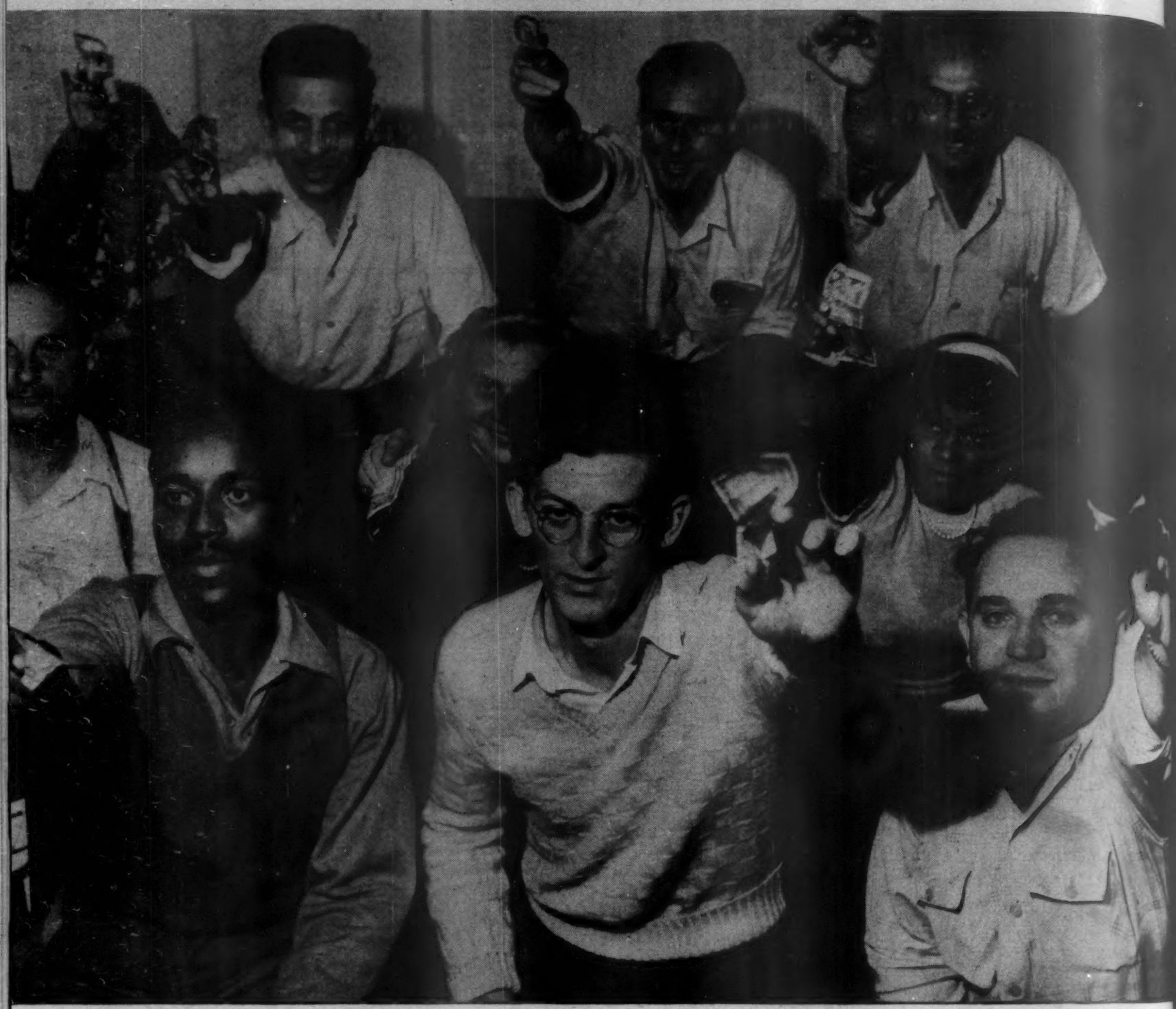
Are the prices of industry's products high? If so, what has made them high? How do they compare with the prices for farm products? Which contribute most to high cost of living—prices of industry's products or prices of farm products? What is the position of the specific company telling the story? How high are its prices? How high are its costs—for labor, materials, and equipment? How high are its taxes? How high are its profits? The answers constitute the industry story.

True, there is such a thing as prices that are too high. A company that is charging too much for its products—that is making too much profit—will know it and will be unwilling to tell its story. And of course it should lower its prices.

But the company that has a sound story has a convincing story. By and large, that is the position of the average manufacturing company. Taken as a whole, the manufacturing industries need not apologize for the few cents of the sales dollar that are either paid to stockholders or used in replacing equipment.

If enough manufacturing companies will do the right employee relations job—by giving operating facts to their employees—and the right public relations job—by publicizing those facts in their communities—a great deal will be done to offset election-year economic hysteria and downright misinformation.

L. C. Morrow



THROUGH WORKER CONTRIBUTIONS—LIKE THESE DOLLAR BILLS FOR PAC—UNION LEADERS EXPECT TO RAISE MILLIONS . . .

Labor's Political Action

J. M. GAMBATESE • LABOR EDITOR, WASHINGTON BUREAU

This is the year industry gets a respite from labor's heavy firing. For 1948 Big Labor raises a new target for its big guns. It's Congress.

As in many other segments of American life in this presidential election year, politics comes first with organized labor. Management is getting new demands, of course. Third-round wage increases. Pensions. Sick benefits. Annual wage. But labor leaders want to settle them with little fuss. They prefer the bargaining table cleared for—to them—a bigger job ahead. Nothing must interfere.

Leaders of 15,000,000 union members—largest in history—want to change the complexion of Congress. Dissatisfied with the 1947 record of the 80th Congress, they would help elect in 1948 a new Congress that will repeal the Taft-Hartley labor law in 1949; a Congress that will also stem the rising cost of living. The major issues are clear—*Taft-Hartley and inflation.*

THE ISSUES

The Taft-Hartley law, of course has been raised as the main issue by the labor unions. But the CIO also uses other yardsticks in measuring members of Congress.

On the 1947 record, the CIO also looks at a Senator's vote on seven other issues, and at a House member's vote on nine others.

In CIO's book, a Senator voted "right" if he:

VOTED AGAINST

- Taft-Hartley
- the portal-to-portal pay bill
- overriding tax bill veto
- Reed-Bulwinkle bill to exempt railroads from parts of anti-trust laws
- seating Senator Bilbo
- raising ceilings on veterans' job-training pay

VOTED FOR

- rent control extension "as is"
- confirming David Lilienthal as chairman of Atomic Energy Commission

A House member voted "right" if he:

VOTED AGAINST

- Taft-Hartley
- Portal-to-portal pay bill
- reduced Labor Department appropriations
- cut in rent-control enforcement funds
- recommitting RFC extension bill so as to permit RFC to buy GI home loans
- overriding tax bill veto

VOTED FOR

- recommitting Agriculture appropriations bill
- recommitting Interior appropriations bill
- anti-poll tax bill
- recommitting Rees loyalty bill for government workers.

TO BE USED IN AN ALL-OUT POLITICAL FIGHT IN 1948 . . .

LABOR TARGETS

On the final vote to override Truman's veto, 68 Senators and 331 House members voted for the Taft-Hartley law. Terms of 28 of the Senators and all of the House members expire this year.

Here's the Senate line-up:

DEMOCRATS (10)

John L. McClellan, Arkansas
Richard B. Russell, Georgia
Allen J. Ellender, Louisiana
James O. Eastland, Mississippi
Carl A. Hatch, New Mexico
William B. Umstead, North Carolina
Burnet R. Maybank, South Carolina
Tom Stewart, Tennessee
W. Lee O'Daniel, Texas
A. Willis Robertson, Virginia

REPUBLICANS (18)

C. Douglass Buck, Delaware
Henry C. Dworshak, Idaho
C. Wayland Brooks, Illinois
George A. Wilson, Iowa
Arthur Capper, Kansas
John Sherman Cooper, Kentucky
Wallace H. White, Jr., Maine
Leverett Saltonstall, Massachusetts
Homer Ferguson, Michigan
Joseph H. Ball, Minnesota
Kenneth S. Wherry, Nebraska
Styles Bridges, New Hampshire
Albert W. Hawkes, New Jersey
E. H. Moore, Oklahoma
Guy Cordon, Oregon
Harlan J. Bushfield, South Dakota
Chapman Revercomb, West Virginia
Edward V. Robertson, Wyoming

AGAINST CONGRESSMEN (ABOVE) WHO VOTED FOR THE T-H LAW

for '48

Between now and November 2 the Greens, the Murrays, the Lewises, the Krolls, and the Whitneys hope to rally every force at their disposal behind the big push for a favorable Congress. Money, men, ideas. No political techniques—or tricks—will be overlooked in the Battle of the Ballot.

For a proper perspective, let's go back to the spring of 1946. Congress met in its first post-war session. Outside Washington, labor strife ran rampant, broke all records. Truman's Labor-Management Conference had failed. General Motors strikers held out for

PAC HEADQUARTERS bombard workers with instruction booklet, registration data, voting records, economic material

POLITICAL ACTION IS AIMED (1) AT GETTING EVERY WORKER OUT TO VOTE . . .

PAC'S ARMY OF BLOCK WORKERS WILL BE CAREFULLY SCHOOLED IN THE NEWEST AND BEST DOORBELL-RINGING TECHNIQUES

THE BLOCK WORKERS

CIO-PAC is trying to make block workers of one million members. "How We Win," a PAC instruction pamphlet, tells how the block worker operates:

"The block worker makes it his business to visit every family on his block. Some evening he pays a call on them and tells them he's a CIO-PAC block worker. He wants to know if they're registered and if there's any help he can give them in getting registered.

"He doesn't stay too long. He doesn't argue. He doesn't 'lay down the law.' He doesn't take notes while visiting. He's just a good neighbor who is a true believer in democracy.

"When new families move in, he visits them to find out if he can help—and to make sure they've changed their registration address.

"He visits each family every two or three weeks. He keeps a notebook and jots down pertinent facts about each family. When election time rolls around, he distributes literature and explains the stand of the candidate he is supporting. He makes sure the people vote and he should know how they will vote, and why."

113 days, steel workers for three weeks. Railroad traffic stopped.

In desperation, Truman begged Congress for drastic powers to draft strikers. Cooler heads in Congress prevailed. When the furore ebbed, Congress passed the Case Bill to curb labor abuses. Labor leaders screamed. Truman killed the bill.

Incensed at Congress, the CIO Political Action Committee marked for defeat every member who supported the Case Bill—255 in the House, 49 in the Senate. It felt its muscle. Hadn't it won a fourth term for Roosevelt in 1944 after New Deal strength had slipped two years earlier?

But the story of the 1946 election was different, radically different. The Democrats—the New Deal party—lost control of Congress to the Republicans. More than that, the voters swept out of office many so-called friends of labor. LaFollette, Biemiller, others. They elected a Congress which, the following June 23, gave the country the "Labor Management Relations Act, 1947." They call it Taft-Hartley, after its authors, Sen. Robert A. Taft of Ohio and Rep. Fred A. Hartley, Jr., of New Jersey.

This time, even Truman couldn't block it. More Democrats voted for it than against it.

As one, labor leaders rebelled.

"Diabolical monstrosity . . . to destroy labor unions," cried the normally placid Philip Murray, CIO president. AFL President William Green called for a work holiday on Election Day to bring out the labor vote against this "vicious and obnoxious" law.

To John L. Lewis, who rules the destiny of half a million miners with a strong hand, the law is "the first mighty savage thrust of fascism in America."

Union leaders flexed their muscles, beat their breasts. The law is unconstitutional. Everyone who voted for it is an enemy of labor. This "slave labor" law must be repealed. So the cries went.

The big labor organizations have flung the challenge in Congress's teeth. Election year is here. The battle is of their own making. Have they the punch to deliver? Or will they fail, as they did in '46?

Let's look at (1) labor's political organizations, (2) their program, and (3) their possible effect at the polls in November.

Labor Will Use This Machinery

What political machinery do the unions have?

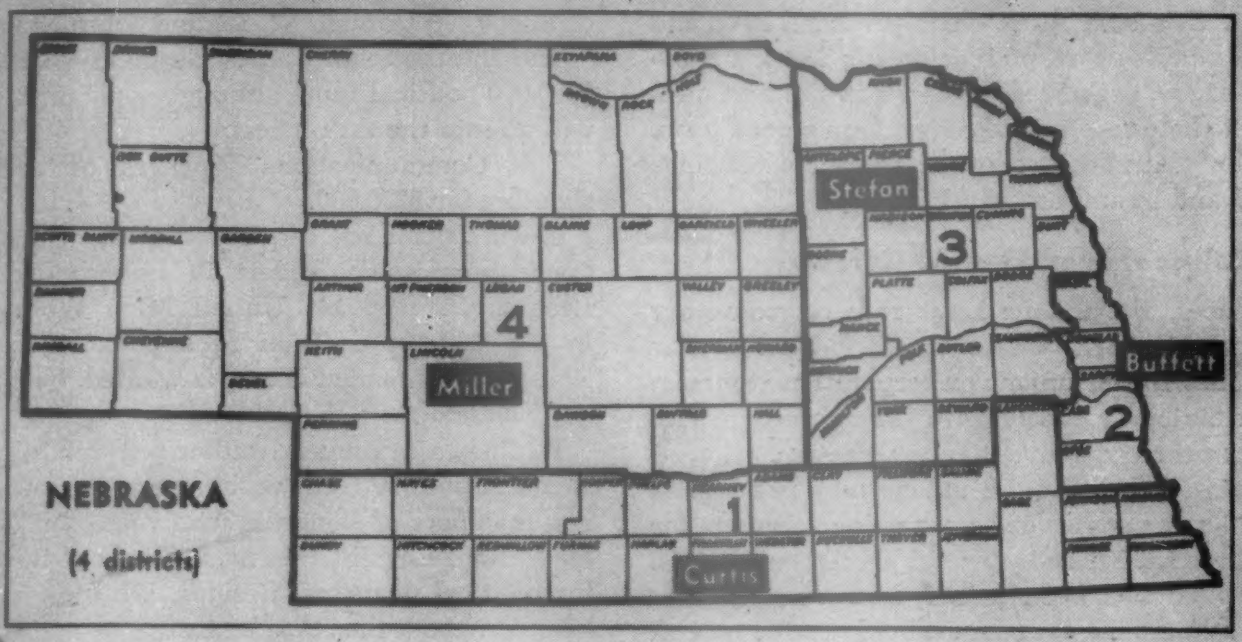
Best known and most effective has been CIO's Political Action Committee, in business since 1943. A relative newcomer is AFL's Labor's League for Political Education.

Eighteen railroad brotherhoods have banded together in Railway Labor's Political League. A. F. Whitney's trainmen and Alvanley Johnston's engineers, who struck in 1946, are not included. They have their own political machine.

The Machinists' Non-Partisan Political League is

AND (2) AT GIVING HIM THE KIND OF INFORMATION HE NEEDS TO VOTE RIGHT

Every Representative and Senator From Nebraska Is Against Labor



Most trade unionists, like most Americans, don't even know the name of their representative in Congress, much less how he votes. Because of this indifference on the part of the voters, Congressmen have long been able to ignore the wishes of the majority of their constituents.

To help trade unionists and other voters, The Machinist *is publishing this series of maps to help every voter identify his Congressman. Each state map shows the counties in that state and the Congressman who represents that county.*

We suggest that all machinists clip the maps of their own state, post them on bulletin boards in the lodge hall, in the shop and elsewhere. This is the twenty-third article in the series.

THE WORKING MAN from Nebraska is without a single champion in the National Capital—all of the representatives and senators from that state voted in favor of the Taft-Hartley Act.

Not only did they vote solidly to pass the bill when it came up for a vote, but they also voted to override the President's veto. Thus, without a single exception, the Nebraska delegation in Congress has forfeited any claim they might otherwise have to support from the working man.

Here is the official voting record:

Nebraska

District	*Representative*	*Residence*	*Party*	*Vote on Veto*
1	Carl T. Curtis	Minden	Rep.	Override
2	Howard Homan Buffet	Omaha	Rep.	Override
3	Karl Stefan	Norfolk	Rep.	Override
4	Arthur Lewis Miller	Kimball	Rep.	Override

The two senators from Nebraska are Hugh Butler, a Republican of Omaha and Kenneth Spicer Wherry, a Republican of Pawnee City. They both voted to pass the Taft-Hartley Act and to override the President's veto. Next week: Nevada.

A.M. Joins In esident's Drive Aid Disabled

I.A.M. will cooperate President Truman's e a new deal to the ,000,000 partially ons—war veter- ns of automobile others.

ed by General Vice es, who was des- t the I.A.M. at he President's nd employment handicapped. to the White ard Mr. Tru- rt by employ- jobs for the pped, the 100 mmittee worked lping less for- work. The

int labor- roughout

• Collaboration with Governors committees working on the same merit to individuals and organizations who have cooperated in the

THE MACHINIST, published by the powerful International Association of Machinists, tells its readers each week how Congressmen in a given state voted on the Taft-Hartley Act. This week (December 18), Nebraska; next week, Nevada

the new political vehicle for the big International Association of Machinists. Technically IAM is an unaffiliated union. For practical purposes, it is considered part of AFL and, because it has 90,000 members in the railroad shops, also plays ball with the railroad brotherhoods.

The 230,000 members of the Communications Workers of America will function through their legislative committee.

Although not strictly a union organization, the American Labor Party has been the party of many unions, as well as Communists, in New York State.

Least heard of is an outfit which preceded PAC and once ruled labor's roost, politically. It's Labor's Non-Partisan League, organized by Lewis in the first days of the CIO to help re-elect Roosevelt for a second term. Lewis never relaxed control over it in his meanderings out of CIO and in and out of AFL.

Political Fund May Be Colossal

For finances, the unions must rely on voluntary contributions. Section 304 of the Taft-Hartley law makes it unlawful for unions or corporations to make "any contribution or expenditure" in connection with any federal primary, convention, or election.

This means, then, that the unions may not legally dip into union treasuries or assess union members for political purposes. There is general agreement on this.

The question has been raised, however, whether union newspapers may support candidates for federal office and to what extent. CIO has challenged this point in the law, as an attack on freedom of the press, in two special Congressional elections. Extra copies of the *CIO News*, a weekly newspaper, endorsing candidates for Congress were distributed in Baltimore and Allentown, Pa., during election campaigns in those cities.

Justice Department investigators got to work, but action had not yet been taken after five months. Even if charges are brought, final court action could not come in time to bear seriously on this year's campaigns.

Prevailing opinion in Congress is that the Taft-Hartley law was not intended to gag the labor press. Editorial opinion and support of candidates, as is generally practiced by newspapers of all kinds, will not be interfered with. Otherwise, the big daily papers owned by corporations could not endorse political candidates either, because the restriction on "expenditures" applies to corporations as well as unions.

The test will hinge, really, on whether unions or other publishers of newspapers may spend funds for extra copies distributed as campaign literature.

How much will the unions spend? If the leaders get what they ask, it will run between $15,000,000 and $20,000,000. The bald fact is that they won't get it. They never do.

PAC in the past has relied on large contributions from its 41 affiliated unions for primary activities. After the primaries, it dipped into the dollar contributions from individual CIO members. PAC's national headquarters in Washington says PAC spent only $700,000 in 1944, $400,000 in 1945-46, and about $125,000 last year. These figures look awfully low.

This year PAC will encourage each of CIO's 6,000,000 members to donate more than $1. The standard $1 previously printed on receipts is being removed, leaving a blank space for entering larger donations. Theoretically, then, PAC could rustle up $6,000,000 or more.

LLPE—the AFL—is asking at least $1 each from a claimed 8,000,000 members. Here's another theoretical $8,000,000.

Railway Labor's Political League certainly can't ask for less than dollar bills from the 1,250,000 members of affiliated unions. So add another $1,250,000.

The Machinists' Non-Partisan League seeks a fund of $1,000,000 through $2, $5, and $25 memberships.

The International Ladies Garment Workers plan a $500,000 political fund, although some of this probably will go into the AFL chest.

The Communications Workers of America are shooting for $250,000.

Lewis's plans are a question mark. Outsiders don't know how much is left in Labor's Non-Partisan League. In 1936 his United Mine Workers kicked in $425,000, in addition to a $225,000 loan, to the Roosevelt campaign. If Lewis wanted, he could easily get $500,000 from his miners.

Whitney's trainmen authorized him, in 1946, to spend $2,500,000 from union funds to defeat Truman and members of Congress who voted for "anti-labor" legislation. Legally this money cannot now be spent for political purposes. Besides, Whitney has changed his mind about the President since he vetoed the Taft-Hartley law. How much political money the trainmen and engineers, who are not participating in RLPL, will try to raise, is only a guess. It won't be more than a few hundred thousand dollars.

This adds up to more than $15,000,000. Taking a practical view, we don't look for the labor organizations to raise more than $5,000,000, if that much. In most instances, part of the contributions will be retained for spending by individual unions or in local areas. National PAC gets only 50 cents of each dollar contribution.

What the Unions Will Do With Their Money

How will the unions spend the money raised? What are their plans?

Most significant is the importance being attached to the political campaign. As we said at the beginning, labor gives political action top priority in 1948. AFL, at the San Francisco convention in October, felt impelled, for the first time, to ape CIO in playing politics on a national scale.

Today AFL like CIO has a political arm on which it hopes to develop plenty of muscle between now and November. So have the Machinists, the railroad brotherhoods, and others. Like the Democratic and Republican organizations, the strategy, techniques, advice, and direction come from Washington headquarters. But the leaders know that the real work must be done at the "grass roots" by state and local organizations. The national unions have their own political departments, and hope to break them down at various levels right down to the plant locals. These activities of individual unions will be tied right in with,

and made a part of, the major political vehicle, such as PAC for CIO unions and LLPE for AFL affiliates.

Union political leadership is not being left to underlings. It's all top-level stuff. Green himself is chairman of LLPE. George Meany, AFL secretary-treasurer, will manage the finances. In seeking a director, AFL has looked toward persons of national political prominence, including former Senators James M. Mead and Robert M. LaFollette.

Jack Kroll, chairman of PAC, served as assistant to the astute Sidney Hillman, original PAC chief, before Hillman's death in 1946. He hails from Taft's home, Cincinnati, where he has long headed the joint board of the CIO Amalgamated Clothing Workers.

Harvey W. Brown, president of the machinists' union of 625,000 members, directs the Machinists' Non-Partisan Political League. Heading up Railway Labor's Political League is Arthur E. Lyon, executive secretary of the Railway Labor Executives Association.

In the giant CIO United Automobile Workers, Pres. Walter P. Reuther has put himself in charge of politics. Previously a vice-president had command.

"We have to mobilize for an all-out political fight in 1948," Reuther told the UAW-CIO convention last November. "And this is not something that you put at the bottom of the agenda in your local unions; this goes smack on the top of the agenda of every union meeting. It is not a side issue you get to when everything else is completed; it is the top priority issue in the year ahead. We have to do a job of mobilizing our political power to clean house in Congress in 1948."

Lewis and Whitney, of course, take personal charge of political dealings in their own organizations.

Operation Details Still to Come

Techniques the new labor political organizations will employ in seeking their objectives have not crystallized as this is written. So far, we have little more than their bare organizational structure and the method for raising finances. How the machinery will swing into action remains to be determined as to details. LLPE is making plans at Miami this month.

This much is assured: Labor will use the radio, the press, the platform, movies, pamphlets, and other accepted propaganda techniques. How far it will go in doing a political job in the wards and precincts of the country, is not yet known. Except for PAC.

The 1946 debacle taught PAC a lesson. As a result, it has changed its approach to political action.

In the beginning, in 1944, PAC figured that a good majority of the people approved of FDR's policies. Therefore, with him on the ballot, all it had to do was get the voters to the polls. More would vote for Roosevelt than against him. With Roosevelt winning four times, who could say PAC was wrong? It's said that nothing succeeds like success. PAC concentrated on pamphleteering, public relations, and trick propaganda with this major objective: *Get out the vote.*

Truman is no Roosevelt. The public relations job wasn't enough in 1946. It took more than pamphlets. PAC decided it needed a political organization within CIO to be effective in 1948. Alan Reitman is publicity director, but today he spends 75 per cent of his time building PAC units in the state and local CIO councils and in the national and local unions. Regional divisions have been discarded.

Nationally, PAC ideas are translated into action in an unpretentious converted apartment building in Washington, a block from the White House.

PAC policy comes from Kroll and the presidents and secretary-treasurers of the five largest CIO unions—auto, steel, electrical, textile, and clothing workers. This takes in Murray, president of the steel workers; Reuther; Emil Rieve, textiles; and Jacob S. Potofsky, clothing. But it also includes Julius Emspak, secretary-treasurer of the United Electrical, Radio & Machine Workers, often accused of being a Communist party-line follower. This year the Communists back Henry Wallace's third-party candidacy.

PAC knows it must do more than bring out the vote. It must also see that the people vote "right." Both PAC and LLPE say they must "educate" the workers on the issues of the day; show them how their economic interests extend beyond the bargaining table to the halls of Congress.

As one leader of PAC told us: "We must show the workers how a wage increase can be wiped away by a Congress that permits increases in living costs."

Reuther puts it this way:

"We cannot solve the complex problems that face us if we fight only in the economic field. We have to fight both in the economic and political fields, because what you win on the picket lines they take away in Washington if you don't fight on that front. We are learning that at great cost.

"We have the job of making our people realize . . . the relationship between bread box and ballot box."

In an organizational way, PAC is:

Making PAC a working unit in every state and city CIO council and in every national and local union.

Organizing block workers patterned after the wartime civilian defense program. PAC wants a million block workers from CIO's six million members. This is called the "1 in 6" drive.

Establishing communication lines from Washington, through PAC lieutenants, to workers all over the country. It uses special releases, Negro press, foreign-language press, pamphlets, radio spot announcements, songbooks, sound trucks.

PAC workers are bombarded with instruction booklets, registration data, Congress voting records, economic material.

How Effective Will Political Action Be?

How much dynamite will labor's political punch pack? How effective will it be?

It is hard to tell this early. But past experience can be of some guidance. The last presidential election indicated at least this: *Labor leaders cannot—simply as labor leaders—deliver the vote of their membership for any particular candidate. Union members have to be sold on the issues.*

This was demonstrated by the miners, who follow Lewis blindly most of the time. They voted for Roosevelt against Lewis's wishes.

Before November, the working man will have to be

convinced, for example, that the Taft-Hartley law is an injustice. He will want to be convinced that one candidate will serve his interests better than another.

What happens in November, then, will be determined largely by what happens to the cost of living; how Congress and the Administration attempt to cope with rising costs; how the Taft-Hartley law works in practice, rather than theory. These are the big issues. Other factors crowd into the picture.

Labor Won't Support Wallace

There's the Wallace candidacy. How much will it cut into CIO and "liberal" support of Truman? Will it make a difference in a hotly contested and crucial state like New York or California? Who can tell?

Except for Communists and the extreme left fringe, organized labor opposes the third-party aspirations of Wallace. The American Labor Party is the only significant labor outfit behind him, and its strength has been sapped by withdrawal of right-wing unions. PAC also will lose support of extreme left-wingers, but hopes to make this up by greater interest on the part of the anti-Communists in CIO.

PAC and Whitney will back Truman, as they did Roosevelt. What will AFL, the Machinists, the other railroad unions, and Lewis do? In the past, AFL did not take a stand on the presidency. Likewise the Machinists. Will they back one of the 1948 White House aspirants?

They may wait to get a look at the Republican nominee. If it's Taft, AFL may break precedent and go for Truman. If it's someone else, say Stassen, they may take no position. So the identity of the Republican candidate also must be considered.

Most political observers interpreted last fall's off-year elections as a swing away from the Republicans. In many elections the AFL, CIO, and other labor groups worked together and will do so again this year despite the lack of cooperation at the top. This was true in St. Louis, Wilkes-Barre, Pa., Jacksonville, Fla., and elsewhere.

Even where they do not join forces, they can be effective when they back the same candidates. Both CIO and AFL take credit for Rep. Earle C. Clements, a Democrat, taking the Kentucky governorship away from the Republicans.

AFL, CIO, and railroad brotherhoods successfully backed Judge Edward A. Garmatz, a member of AFL, who was elected to Congress from Baltimore in July.

But they failed to put over Philip Storch, CIO Newspaper Guild member, who ran for Congress in Allentown, Pa., in September.

The labor organizations have indicated that they will concentrate next fall on defeating every member of Congress running who voted for the Taft-Hartley law. They know this is impossible of achievement. Shrewd counsel dictates that they concentrate on those districts and states where they have a chance. "Don't pour money down a rat hole," is the advice.

Often organized labor has found itself confronted with having to choose between two candidates, both of whom may be undesirable. To avoid this situation, labor political strategists plan to pay more attention to the primaries and political conventions. A friend can't be elected unless one is nominated.

The first primaries will be April 13 in Illinois and Nebraska. The last can be as late as October 11 in Connecticut.

Hillman used to say there were 100 Congressional districts in which the labor vote could be decisive. PAC can be expected to concentrate its efforts on defeating up to 125 of the 331 congressmen who supported Taft-Hartley, and 12 or 15 senators. Forty of the 68 senators who backed the law are not up for re-election.

In the South, where nomination amounts to election, the job will have to be done in the primaries.

What are labor's chances of getting a Congress that will repeal the Taft-Hartley law? Unless the law proves undesirable during the year and changes the minds of some legislators who voted for it, labor has little chance of winning this objective. Here's why:

Of the 331 representatives who backed Taft-Hartley, 213 were elected in 1946 with more than 60 per cent of the vote in their districts. Unless a landslide develops, it is unlikely that the unions could swing enough votes in those districts to make a difference. It is in these races, especially, that labor must make its fight in the primaries.

There are 118 of the 331 pro-Taft-Hartley representatives who were elected with less than 60 per cent of the vote. In their districts, labor must be given some chance of upsetting them. Even if all were defeated, there would still be 213 in Congress who approved of the law. This is five short of a majority, but enough to block repeal or substantial amendment of the law.

Eight Senators Face a Serious Threat

In the Senate, labor can swing the balance in 10 of the 28 states whose senators approved the Taft-Hartley law and whose terms expire this year. In two, Maine and Oklahoma, the senators are not seeking re-election.

Minnesota will get special attention. AFL and CIO are grooming Democrat Hubert Humphrey, mayor of Minneapolis, to defeat Joseph H. Ball, if Ball survives the Republican primary. A leader in the drafting of labor legislation in the Senate, Ball favored some measures more stringent than are contained in the law. He is also chairman of the Senate-House "watchdog" committee, keeping an eye on the law.

The other seven Republican senators who face a serious threat from the labor vote, if it can be mobilized, are Buck of Delaware, Brooks of Illinois, Cooper of Kentucky, Saltonstall of Massachusetts, Ferguson of Michigan, Hawkes of New Jersey, and Revercomb of West Virginia.

But labor must do more than elect Democrats, because many of them, particularly in the South, favor the new labor law.

TO SUM UP: An effectively mobilized campaign by the various big labor organizations may elect Truman... It may also return the Democrats to power in Congress... But it won't have the punch to knock out the Taft-Hartley law.

DANGER
STAY AWAY
WARNING SIGNS ARE FOR YOUR PROTECTION!
ALLEY OOP!
I'D USE A LADDER
YOU SHOULD HAVE WORN YOUR GOGGLES!
I HAVE NINE LIVES BUT ONLY TWO EYES!
LOOK OUT FOR FALLING OBJECTS
CATS PAWS CAN DO THIS! YOU CAN'T!
WATCH YOUR STEP
KEEP FLOORS CLEAR
LOOSE AND TORN CLOTHING IS DANGEROUS AROUND MOVING PARTS
A STITCH IN TIME SAVES NINE
SAFETY RULE NO.1
EVEN I FEEL LOUSY WHEN I STAY OUT LATE!
A GOOD NIGHT'S REST IS ALWAYS BEST

SIX EPISODES IN THE BUSY LIVES OF "KOMPANY KAT," WHO SELLS SAFETY FIRST TO CARNEGIE-ILLINOIS STEELWORKERS

"KOMPANY KAT" SELLS SAFETY

A RIPE old character called "Kompany Kat" is winning friends and influencing people at U. S. Steel's subsidiary, Carnegie-Illinois Steel Corporation. Shown here are six episodes in Kat's busy lives. Selected from a series of 24 copyrighted posters created for Carnegie-Illinois by a well-known newspaper artist, they are excellent examples of the cartoon technique applied to the problem of getting workers to think continuously in terms of safety.

These cartoons are blown up into 24-sheet billboard posters and placed on outdoor advertising boards at the various plants. In addition, appropriate locations have been selected throughout the plants with a flat area large enough to accommodate the posters. Replicas of the cartoons, printed on poster stock in a size practical for departmental bulletin boards, are posted throughout the plant areas as a supplement to the 24-sheet posters. Both the billboard and bulletin board posters are changed approximately every two weeks.

PRODUCTION FOREMAN PICKS UP TELEPHONE . . .

MAINTENANCE CLERK WRITES ORDER ON FORM. . .

SERVICE REQUEST NO. 46995

THE GLENN L. MARTIN COMPANY

DATE	TIME RECEIVED	REQUESTED BY	CHARGE NO.
12/5/47	9:15 ☒ A.M. ☐ P.M.	Eagleson	

PLANT	BLDG.	FLOOR	SECTION	DEPARTMENT	EXTENSION
I	A	1	D18	811	254

One 200-watt bulb is out. Please replace

MACHINE REPAIR	MILLWRIGHT	HEAT. & VENT.	TRUCKS

ELECTRICIAN	PLUMBER	CARPENTER	OTHER
✓			

TIME ASSIGNED 9:30 ☒ A.M. ☐ P.M. — NAME OF WORKMAN ASSIGNED John Doe

REMARKS

ORDER NUMBER

DATE COMPL.	TIME COMPLETED ☐ A.M. ☐ P.M.	WORKMAN'S SIGNATURE

ORDER FORM SHOWS NATURE OF WORK TO BE DONE, AND BY WHAT CRAFT

REPAIRS EXPEDITED BY TELEPHONE

No hunting around for repair order forms. No time lost in sending the request to the maintenance department

G. A. WADSWORTH • CHIEF OF MAINTENANCE, THE GLENN L. MARTIN COMPANY, BALTIMORE

THE instructions, "For Maintenance Phone 592," are posted in all washrooms and on all plant service units in the plant. They have been memorized by every production foreman. They are the heart of a simple maintenance system that gets all repair work done in a plant of over 3,500,000 square feet. Production supervisors at Glenn L. Martin order all repairs by telephone. No written confirmations are needed.

The receiving end of extension 592 is a switchboard in the central maintenance office, where the maintenance engineer, two general foremen, and twelve group leaders are located. Here a telephone clerk takes an average of 90 repair calls each day, and translates them to a single-form order system.

This simple procedure controls the repair activities of about 200 craftsmen in the maintenance division of the plant engineering department. It does not govern the preventive maintenance operations of these men, which are controlled by written schedules and check sheets. Plant sanitation is handled

MAINTENANCE GROUP LEADER TAKES THE ORDER FROM CENTRAL ASSIGNMENT RACK

by a separate unit of the maintenance division. New work of any kind is controlled by a different routine involving a series of executive authorizations. But all repair work of any nature, small or large, comes under "Phone 592." Even typewriter repairs.

Where Calls Come From

Calls are accepted only from supervisory or executive sources. Repairs costing over $25 are usually discussed with the department head, or, if of considerable magnitude, with the vice-president in charge of engineering. Action on emergencies, however, is not delayed for expense approval; often the vice-president is consulted for quick confirmation, partly because it is necessary for him to know what is going on.

When a repair call is received at 592, the telephone clerk enters all details on a continuous pre-numbered machine form, about 4x6 inches in size. This form, called a "Service Request" (see illustration) is automatically made out in triplicate. One turn of the machine crank, and the order is ready, with another blank set in place for the next call.

The original "file copy" is held in a numerical file at the call station. Both the "foreman's" and "workman's" copies are put in an adjacent outgoing assignment box which has separate sections for each craft. The clerk is trained to know when and how to distribute the requests. In cases of doubt, she consults a maintenance supervisor who is usually close by. Rush work is expedited by her by telephone.

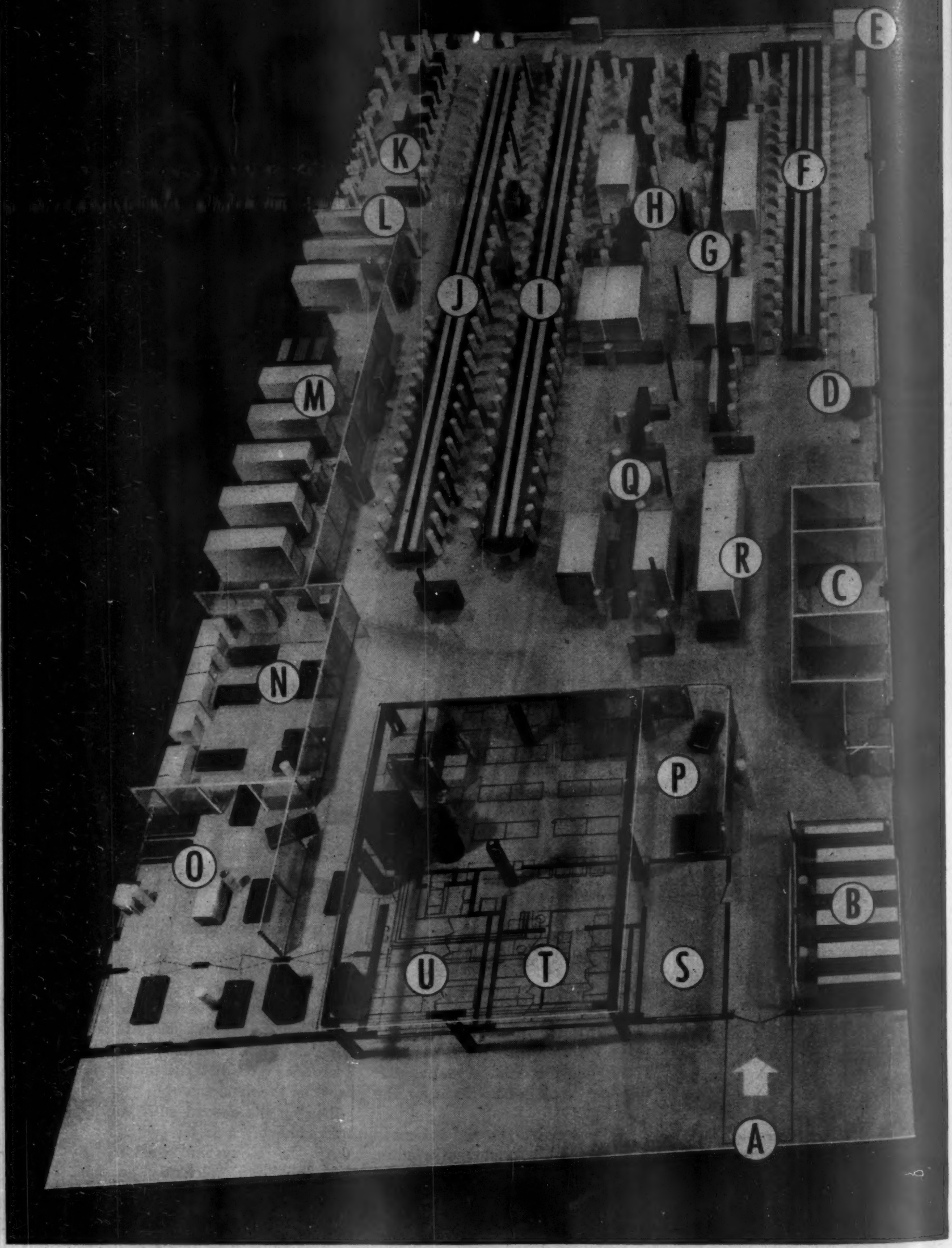
Maintenance group leaders or foremen make work assignments from the box and mark the time assigned. Each leader gives the maintenance worker his copy, and retains his own copy for a record of work load and where his men can be found. If necessary he gives supplemental instructions. When the job is done, the worker has a timekeeper check his time completed, and returns his copy to the group leader. He in turn checks the form, and returns both the worker's form and his own to the clerk at the call station. Here the original is pulled, combined with the other two copies, and cleared through the maintenance timekeeper for labor costs. The entire set is then filed for 30 days, and thereafter discarded.

Minimum of Traveling

Workmen need not return to headquarters for each assignment. If not close by, they telephone their leaders for assignments and mark up the requests later on. Traveling time is charged to the new job. Workmen do not get signed approvals from production supervisors because too much time is lost thereby for the rare possibility that the job may not be right.

This system really makes for prompt service. Most repair jobs are completed during the same shift. If not, the workman's and foreman's copies are turned over to the next shift foreman for reassignment. Time data for more than one shift or more than one workman are entered on the obverse side of the request. Often new requests, such as relamping in an office, are held for the second shift when they can be done without disrupting the work of the department.

During the second shift another telephone clerk is on switchboard duty. In a system working so smoothly and efficiently as this, there can be no let-down in the promise "For Maintenance Phone 592."



SEE LEGEND on facing page to identify equipment in scale model of Motorola's television department. Here is further proof that three-dimensional layout is within the reach of any plant and will return first cost many times over

SCALE MODEL COST $400, WILL SAVE THOUSANDS

"It's amazing what you see," says a Motorola executive of his company's venture into a three-dimensional layout

ERNEST V. PHILLIPS • METHODS ENGINEER, MOTOROLA, INC. RADIO DIVISION, CHICAGO

A SCALE MODEL of Motorola's new television plant permitted engineers, production men, and other members of management to take a look into the future. It eliminated crystal gazing, provided a tool for planning and installing the new department.

The problem was to manufacture television sets in the most efficient manner—to permit distribution in the competitive market. We tried floor-plan sketches and found that they gave us a pretty good idea of how the department would function. But pretty good wasn't good enough. Three-dimensional layout was the only answer.

Four basic reasons were given to management when funds were requested to build the model:

1. Through more accurate planning, building costs could be cut to the minimum.

2. Use of the third dimension would enable engineers to do a better job—which would result in getting more production out of each square foot of floor area invested in the new department.

3. Facilities, equipment, and assembly lines could be better planned, which would result in smoother flow of materials from the receiving dock through production to shipping.

4. A "lifelike" replica of the new department would aid everyone concerned in having a better understanding of the plan.

Management accepted the idea. The model became a reality. The complete cost, including both labor and materials, was just slightly over $400—an investment that will save Motorola thousands.

The various departmental heads used the model to plan the handling of materials, stock cribs, receiving docks, shipping docks, lighting, power, and similar items. Men responsible for production used the model to plan positioning of workers and to determine flow lines. The maintenance department used the model to install and locate the various assembly lines, test booths, and other facilities required to operate the department.

The Materials Used

The model was built of many different materials, such as wire screen for stock cribs, double-threaded screws for crib supports, plywood for the base and for office partitions, wooden dowels for column supports, transparent plastic for two-floor sections, metal for certain assembly lines, wooden tops for others, and carved wooden blocks for equipment.

The model board is in one section, being 5 feet wide by 10 feet long. The scale used was ½ inch equals 1 foot. The new plant contains approximately 22,000 square feet of floor area and employs about 500 workers.

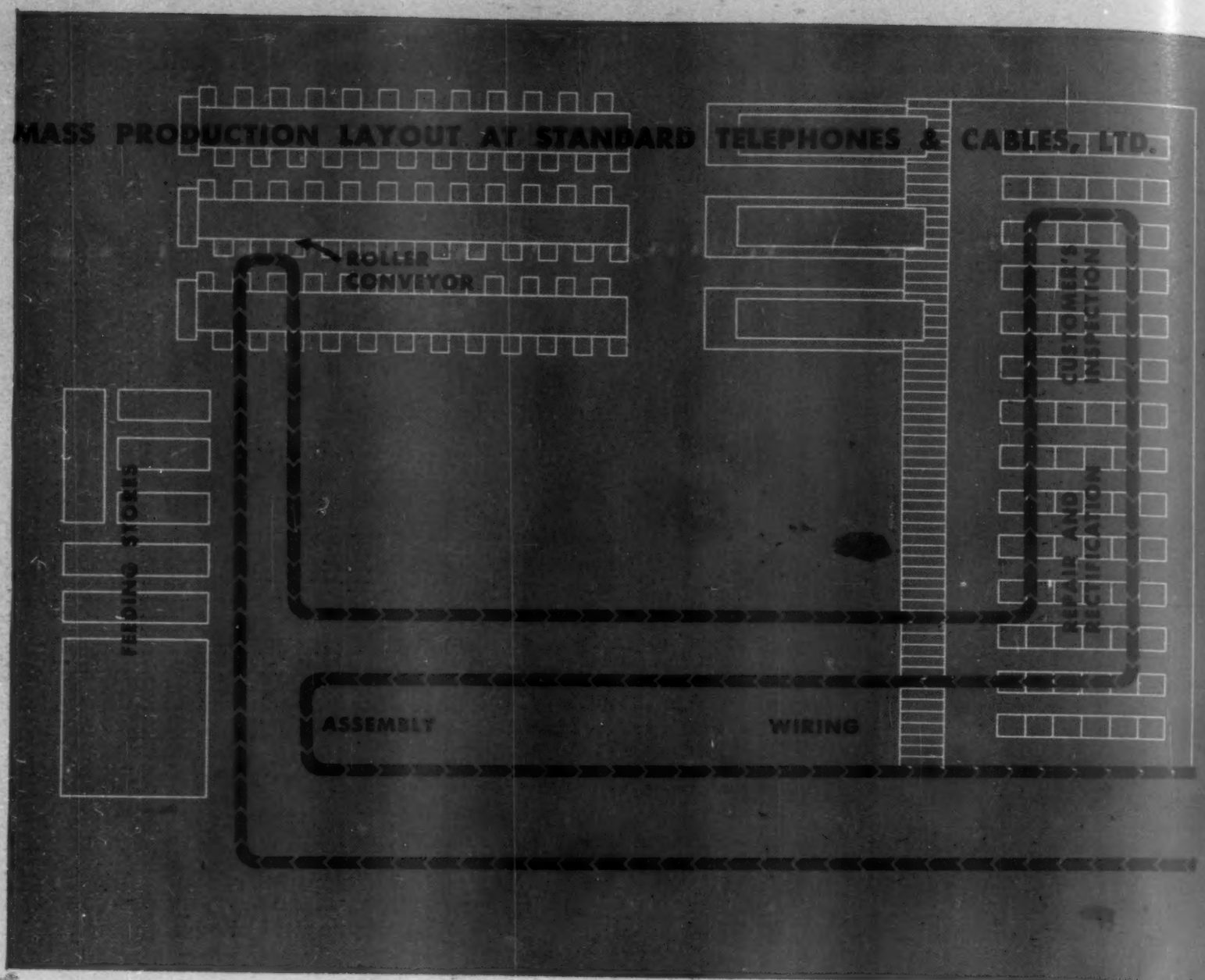
A color coding system of identifying production equipment, facilities, and workers was used to simplify the use of the model. The code is posted right on the board and "tells in a glance" what everything represents.

One of the company's executives summed up the value of the three-dimensional layout being used at Motorola like this:

"Use of the third dimension for making plant layouts brings to life the factory for efficiently planning production just as television brings the radio program to life. It is truly amazing what you see."

LEGEND FOR SCALE MODEL PHOTOGRAPH

- **A** EMPLOYEES' ENTRANCE
- **B** CLOAK ROOM
- **C** OFFICES
- **D** SPRAY BOOTH
- **E** AIR COMPRESSOR
- **F** ASSEMBLY AND WIRING LINE (LARGE MODEL)
- **G** INSPECTION, PHASING, FINAL ASSEMBLY, AND PACKING
- **H** INSPECTION AND PHASING (SMALL MODEL)
- **I** ASSEMBLY AND WIRING LINE (SMALL MODEL)
- **J** PRELIMINARY LINE
- **K** PRESS ROOM
- **L** TOOL CRIB
- **M** STOCKROOM
- **N** INCOMING INSPECTION
- **O** RECEIVING
- **P** FINISHED STORES
- **Q** CONSOLE RAMP
- **R** FINAL REJECTS REPAIR BOOTH
- **S** WOMEN'S REST ROOM
- **T** WOMEN'S LAVATORY
- **U** MEN'S LAVATORY



HOW THE OVERHEAD CHAIN CONVEYOR IS USED TO CONNECT ALL RELATED DEPARTMENTS. CONVEYOR IS 825 FEET LONG . . .

TRAVELING STOCKROOM HELPS

Conveyor stores parts as well as moves them, eliminates manual handling, maintains even flow of production

EVEN work flow, reduced over-all costs, less manual handling, and a minimum of damage to work in process are being obtained through the use of an overhead chain conveyor at Standard Telephones & Cables, Ltd., London, England.

The conveyor serves the feeding, wiring, and inspection benches, the repair and rectification section, and the functional test and packing departments. It is 825 feet long, and has 660 hooks on 15-in. centers. It travels at the rate of 18 feet 2 inches a minute, and takes about 45 minutes to make a complete circuit of the departments.

The time taken to carry out assembly, wiring, and testing operations on the panels is dependent on the particular variety being worked on. Each operator handles a number of varieties in the course of the day. It follows, therefore, that any plan to maintain an even flow of work must be flexible enough to allow for this factor, and provide a cushion between successive operations to even out the variations in production time.

Piece parts required for the panels are delivered to the feeding stores from the main store. Subassemblies, such as relays, transformers, rectifiers, and selector mechanisms, are delivered from the assembly shops dealing with these units.

At the feeding stores complete sets of piece parts and subassemblies, with the exception of standard screws, nuts, and washers, which are stocked in trays on the assembly benches, are put into fiber boxes, one for each panel, and placed on the roller conveyor along the front of the stores. From there they are fed as requisitioned to the assembly benches by belt conveyor.

One Frame for All Panels

A universal cradle has been designed to accommodate all the different types and varieties of panels. At the assembly benches,

TAKES 45 MINUTES FOR IT TO MAKE A COMPLETE CIRCUIT HERE CONVEYOR PASSES BETWEEN ROWS OF INDIVIDUAL BENCHES

OUTPUT IN BRITISH PLANT

panels are assembled on these cradles and are not removed from them until they reach the packing department—except during the functional test, which consists of plugging the panel into a switchboard to reproduce working conditions. Empty cradles are taken by the assemblers from the chain conveyor where they have been placed by the packing department after removal of the finished panel. The conveyor thus forms a store for the empty cradles, as well as a means of keeping them in circulation.

A feature of the wiring section and the test and inspection section is the herringbone benching. It comprises a long central bench in line with the overhead conveyor, with the individual benches staggered at right angles to it on both sides. Air, gas, and electricity lines run under the central bench, with outlets located at each side-bench position.

Operators all face one direction on one side, and the opposite direction on the other, so that the service connections on the central bench, and the conveyor, are on their right.

Color Shows Next Operation

A system of color coding enables operators to identify panels on the conveyor which are ready for their particular operation. On completing an operation a tag is attached to the panel by the operator before it is returned to the conveyor. These tags are painted with clear symbols, representing various stages in the progress of the panel.

Operators in each section are experienced in dealing with all varieties of panels. Should it happen that, having returned a panel to the conveyor, another of the same variety, coded for their operation is not in sight, they are expected to take down the first panel that is suitably coded.

Every morning a check is made of the panels on the conveyors. This is done by noting the color code of each panel as it passes during one circuit of the conveyor. From this check it is possible to determine the load of work at each operation, and the shop supervisors can rearrange the number of workers to restore the balance.

WHAT MAKES A SUPERVISOR EASY

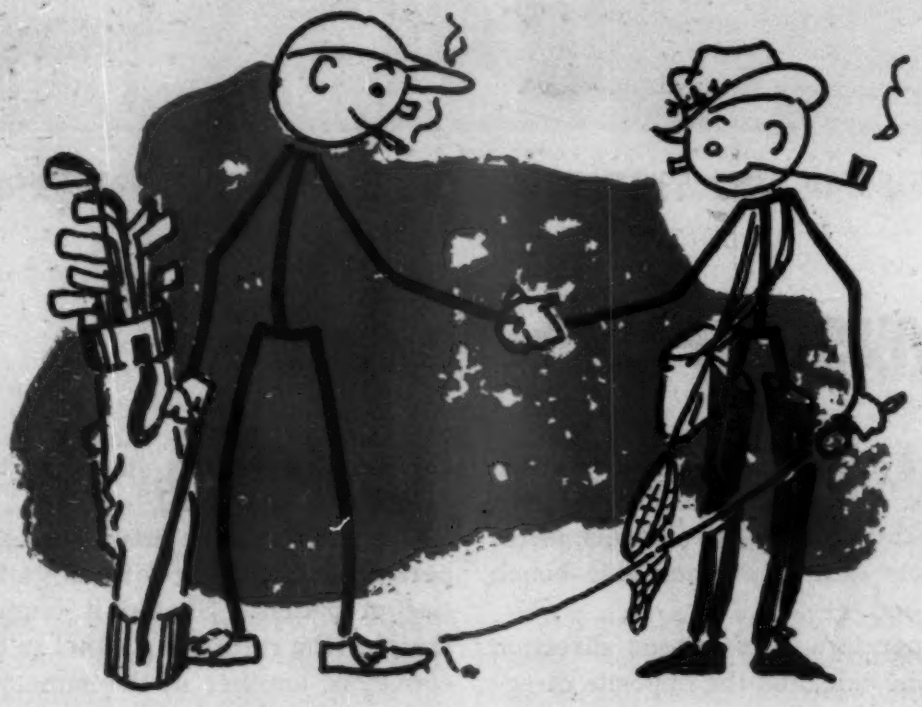
Second of two articles. The companion piece, "What Makes a Supervisor Hard to Work For," appeared in January

JACK W. TAYLOR • TRAINING SUPERVISOR, OWENS-CORNING FIBERGLAS CORPORATION, HUNTINGDON, PA.

HUMAN INTEREST • One of the first things Charlie Bridgens did on the day I started to work here was sit down and talk with me about *me*—my name, my home, my family, my hobbies—a dozen and one different personal things. At the time, I thought it was just routine and wondered why he was going over all the same stuff the employment manager had already covered.

It took a little while for it to sink in, just what kind of man Charlie is. But I know now. He calls me by the nickname I like; he knows my wife's name; he asks about each of the kids—by name; he points out magazine articles about model shipbuilding (my hobby); he helps me with my income tax reports (I'm dumb as an ox about such things). But maybe you don't think that's anything special. Well, maybe not—except that Charlie takes that same sincere, personal interest in every one of his 112 people.

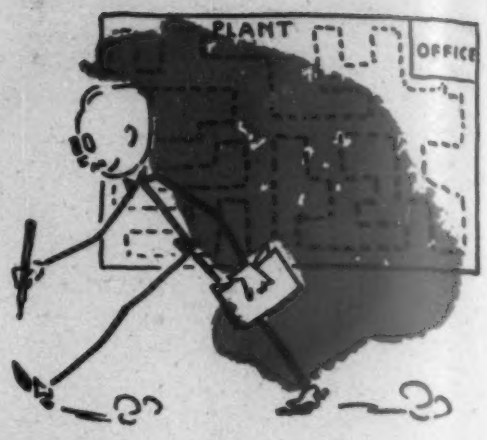
Brother, there's a man who's easy to work for!



MY SOUL IS MY OWN • My supervisor is easy to work for because he's liberal. He likes pie; I like cake. He likes golf; I like fishing. He likes to do a job one way; I like to do it another. What do we both like? Freedom of choice! Freedom to exercise initiative! Never in the years I've worked for him has he attempted to impose his ideas or methods on me.

Our work is not highly engineered and standardized, of course; but then neither can we flout company policy or procedure. The point is that where a certain job is to be done—a certain result to be accomplished—there are usually a half-dozen or more equally good ways of doing it.

And that's why my supervisor is easy to work for. He lets me use *my own* judgment in doing the job. He never tries to "run me."



HE CIRCULATES • My department head has a nice office. It's quiet, it's comfortable. And he has enough work to do in there to keep him busy eight hours a day.

So what does he do? At least once a day he comes out in the shop and stops to talk with every one of us. What we talk about can be almost anything—work, home problems, the kids, sports, company news, the latest job. You might think that slows me down, but it doesn't. Fact is, I work harder the rest of the day.

But I almost forgot the most important thing—my department head not only talks with me, he *listens* to me—pays attention, I mean.

Mister, a guy like that ain't hard to work for.

ACCENTUATE THE POSITIVE • It's hard to put into words. Remember that song, "Accentuate the Positive"? Well, that seems to describe the chief. His attitude is always positive, never negative.

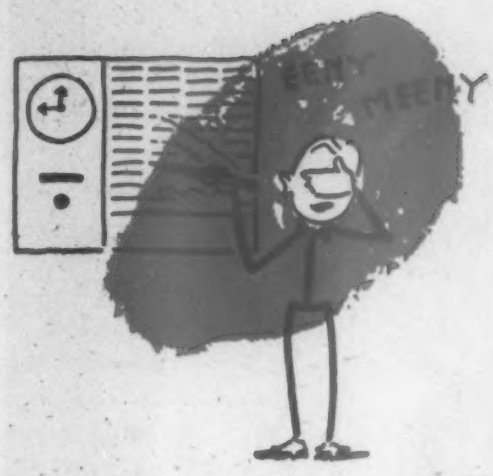
Take what happened last week. I made a bonehead set-up on my machine and turned out over 200 oversized parts before I spotted my mistake. With an ordinary supervisor, that would have been a wonderful chance to blow his top and rake me up and down with everything in the book. But not the chief. He knew I felt like a lunkhead already, so he simply said, "Let's get this fixed up, Joe, while I see whether or not we can salvage those parts."

That's my idea of a supervisor who's easy to work for.

TO WORK FOR

WORDS OF PRAISE • You have to understand one thing right off the bat, and that is that my supervisor is an *unusual* man. He never forgets that besides being an "employee," I'm also a human being and as such like to hear that I'm doing a good job, that my quality is high, that I'm making progress.

Now don't get me wrong. He doesn't hand out a lot of phony mush. You have to *earn* his praise. But when you earn it, you get it—and not ten days late, either. My supervisor is *mighty* easy to work for, in my opinion.



IMPARTIALITY • The way our work is, every one of us has to be able to do any job in the department. That makes the work interesting, but just the same there are certain "dirty" jobs and certain "sweet" jobs. Naturally, it has to be that way.

The thing that makes my foreman easy to work for is that he sees to it that we take turns on the disagreeable jobs, and he assigns the "sweet" jobs so that each man is doing as nearly as possible the work he likes best.

No favorites, see. No pets. The way I look at it, that kind of foreman *makes* it easy for you to work for him.

FREEDOM FROM SNOOPING • I've been working for the same foreman for five years and he has many qualities that make him easy to work for. But the outstanding one, to my way of thinking, is that he never "snoops." I have a certain amount of work to get out each day, but I'm never "spied on" while I'm doing it. I can stop and talk to the guy across the aisle without getting questions or sarcastic remarks.

It isn't that he's not interested, or doesn't know what's going on. He *is* interested, and he knows the score, all right—and he knows *I* know it, too. He just trusts me to do my job the way he does his.

I'll sweat out a "special-rush" job for him anytime he wants.

QUIET, PLEASE • I like my supervisor's quiet way when I'm struggling with a tough job, or trying to get a rush job out on time. He may come over and ask, "Do you think you can make it?" but that's all. He *could* rush me and get impatient—and make me so nervous I'd make a lot of errors—but he doesn't.

And I like the calm way he pitches in himself and takes the responsibility of clearing all the hindrances out of my way, so that we get these special jobs out together.

It may be that I just have a pet gripe about "loud-mouth" people, and "loud-mouth" supervisors in particular, but I dunno—my supervisor never wastes any time on talk and temper tantrums. He's a plenty efficient guy himself, and his quiet way of doing things makes him easy to work for.

JIM, THE APPROACHABLE • Jim, my supervisor, is a close friend of John Gates, who is in charge of Bob's department. Bob said to me the other day, "I wish you'd ask Jim how Gates would feel about my getting transferred over to your department."

Ask Jim? Why not ask Gates direct? I didn't put this question to Bob, but suddenly I began to appreciate Jim the approachable, the responsive.

Here I had been totally unaware of a remarkable quality that makes working for Jim as easy as wearing old shoes. I can broach anything from dollars to doughnuts. No reticence, no explosion; just response, fair and frank. We sometimes even disagree with zest, but somehow no debris from any past encounter ever seems to clutter up the future approach.

A REQUESTER • The thing that makes my boss easy to work for is that he isn't a "boss" at all! I guess you'd call him a "requester." He never tells—he asks! All my life, until I came on this job, someone's been *telling* me to do this and do that. My father, my mother, my teachers, my officers in the Army—mister, I've had it! That's why I appreciate my "requester." Working for him isn't just easy, it's a positive pleasure.

MILWAUKEE

SEQUENCE OF STUDIES

SUBJECT FIELD

Technology
Mathmatics
Drawing
Apprentice readings and reports
Assembly

PRACTICAL JOB EXPERIENCE IN THE MAINTENANCE DEPARTMENT AT FALK CORPORATION IS COUPLED WITH CLASSROOM WORK

TRAINING MAINTENANCE ELECTRICIANS

Training on the job and in the classroom makes full-fledged journeymen electricians out of apprentices at Falk

ROBERT H. WEAVER • INDUSTRIAL RELATIONS DIRECTOR, THE FALK CORPORATION, MILWAUKEE

MANAGEMENT realized years ago that an important responsibility rested upon the shoulders of the electrical maintenance department at The Falk Corporation. To provide an ample supply of trained electrical maintenance men, an apprentice training program was organized. Apprentices serve approximately 8320 hours, just about four years, in training. The program is divided between on-the-job training and classroom theory.

The prime responsibilities of the electrical maintenance department are as follows: (1) To connect all newly purchased or moved machinery and equipment; (2) to maintain in the best of operating order all varieties of existing motors, generators, electrical circuits, and electronic welding equipment; and (3) to assure the manufacturing divisions a supply of power at all times to keep production humming without interruption.

All of these jobs must be done right, with competent help, or else

VOCATIONAL SCHOOL • APPRENTICE DIVISON

MAINTENANCE ELECTRICIAN CURRICULUM • ELECTRICAL REPAIRMAN CURRICULUM

NO. OF WEEKS	CLASS PERIODS PER WEEK
50	4
50	2
50	2
50	2
50	2/3

REQUIRED UNIT COURSES

TECHNOLOGY

Electrical essentials: Elementary d.c. principles
Electrical essentials: Magnets and magnetism
Electrical essentials: Fundamentals and circuits a.c.
D.c. apparatus (generators and motors)
A.c. apparatus (transformers and induction motors)
Control apparatus (d.c. and a.c. motors)
Wisconsin State Electrical Code

MATHEMATICS

Refresher course in arithmetic
Electrical mathematics: Introduction
Electrical mathematics: D.c. calculations
Electrical mathematics: Kirchoff's Laws
Electrical mathematics: A.c. calculations
Beginning slide rule

DRAWING

Electrical blueprint reading: Light and signal circuits
Electrical blueprint reading: D.c. machinery control diagrams
Electrical blueprint reading: Rotating machinery windings
Electrical blueprint reading: A.c. machinery control diagrams

APPRENTICE READINGS AND REPORTS

RESULT IS A MAINTENANCE ELECTRICIAN WHO REALLY "KNOWS HIS STUFF" WHEN HE GRADUATES FROM HIS APPRENTICESHIP

everyone stands to lose—company, workers, and customers. It was with this objective in mind that management at Falk made the decision to organize the electrical maintenance apprentice training program—"to insure the company of an ample supply of skilled and experienced electricians."

Everyone cooperates with the apprentice training program. In fact, many of the company's old-timers express a keen interest in the boys as they pass through the various stages of their training. Perhaps much of this interest and willingness to help the boys is because many of these same men have also, so to speak, "served their time"

A PROUD MOMENT IN HIS LIFE. FALK APPRENTICE RECEIVES HIS CERTIFICATE

in one or more of the company's apprentice training courses.

The Wisconsin State Industrial Commission supervises all apprentice contracts and working conditions. Before an applicant is accepted, he must be approved by the corporation and his apprentice indenture must be filed and approved by the state commission.

All students are required to spend eight hours per week in the classroom until they have completed satisfactorily 576 hours of attendance at the Milwaukee Vocational School. Hours in attendance at the school are counted as part of the hours worked. The apprentice receives his regular hourly compensation and the apprentice indenture is credited with the hours consumed in the weekly instruction periods at the vocational school.

The classroom subjects covered are as follows:

1. A thorough study of electrical essentials including direct current principles, magnets and magnetism, fundamentals of alternating current circuits, types of d.c. apparatus (generators and motors), types of a.c. apparatus (transformers and induction motors), the various kinds of controls apparatus (for a.c. and d.c. motors), and the Wisconsin State Electrical Code.

2. A complete study of the mathematics required including a refresher course in arithmetic, an introduction to electrical mathematics, d.c. calculations, Kirchoff's Laws, a.c. calculations, and a beginner's slide rule course.

3. A detailed study of drawing and design including blueprint reading for light and signal circuits, d.c. machinery control diagrams, rotating machinery windings, and a.c. machinery control diagrams.

Concurrent with these courses the apprentice also must submit readings and detailed reports on subjects allied to his classroom work and on-the-job application.

The on-the-job application portions of the apprentice training program consist of the following six periods:

1. STOCKROOM • To familiarize the apprentice with the parts used in repair work and the relative importance of the quantities and costs involved on the various repair jobs, 520 hours are spent in the stockrooms. It is during this period that the apprentice is on probation in the training program.

2. ARMATURE WINDING • The apprentice must spend 1040 hours in the armature winding division of the electrical department. This is approximately one-eighth of the total allotted time. Most of the time during this period is devoted to the complete rewiring and reassembly of the armatures. This is a very important function at Falk, because of the varieties of motors in use. There are series, shunt, compound, induction, and synchronous with a variation of a.c. and d.c. fractionals to hundreds of horsepower.

3. WIRING • The student spends 2080 hours in wiring new installations and repairing old installations. This assignment may vary from installing a simple desk lamp extension to the wiring of a complicated panel switchboard for automatic machines and electronic welding apparatus.

4. MOTOR TENDER • One-quarter of the apprentice's total time, or 2080 hours, is spent as a motor tender. He must satisfactorily check the oil, brushes, and the cleanliness of motors, starters, and the various types of controls.

5. SHOP ELECTRICAL MAINTENANCE • The training schedule calls for the student to spend 2080 hours in this section. An experienced electrician is assigned to each apprentice when he enters this department. With his tool kit by his side, the apprentice stands ready for action at any time. The repair job may be merely replacing a fluorescent lamp or it may be making a complete electrical check-up on a 20-ton overhead shop crane. It is here that the apprentice proves that he is capable of assuming his duties when he gets his full time assignment upon graduation.

6. MISCELLANEOUS • As many as 520 hours are allowed for miscellaneous refreshers. This time is intended to compensate for normal overlaps or shortages in the various departments. Often, if the apprentice is up to date, this time is devoted to listening in on some new problem that is puzzling the maintenance staff. It is believed that experience of this nature further enriches the apprentice's experience when he becomes a full-fledged electrician.

Upon completion of his 4-year apprenticeship, the graduate is qualified to work as a journeyman electrician. After two additional years as a journeyman, the City of Milwaukee permits him to take an examination for an electrician's license.

The pay the apprentice receives throughout the program is on a sliding scale. Rates gradually increase, the average being approximately 60 per cent of the journeyman's rate. During his later months of service, his wage approaches that of the journeyman's pay.

Graduation day is a fine and auspicious occasion for the new journeyman. Company executives participate in the activities and offer their congratulations to the men. Many years ago, the custom of passing out cigars to all of the graduate's friends was started. This is costly to the graduate, but the look of pride in his eyes when you accept yours assures you that he enjoys the extravagance.

Thus, another group of graduates joins the hundreds of others at Falk which will insure the company of an ample supply of skilled and experienced electricians prepared to work in the maintenance department.

AVAILABLE SOON

1947 Index to

FACTORY

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SENT FREE ON REQUEST

Address the Editor

SINGLE-FORM PRODUCTION CONTROL

Only one form, but all the information needed to guide each part from design to final assembly is instantly available

HAROLD F. KISSEL • PRODUCTION ENGINEER, CAVALIER CORPORATION CHATTANOOGA, TENN.

ONE simple routing form is the basis for control of all woodworking operations at the Cavalier furniture manufacturing plant. It acts as the work order, operation sheet, and blueprint specifications for making all the parts for several hundred types and styles of furniture. These parts run as high as 75 for a dresser and 100 for a chest-on-chest or vanity dresser.

Use of the routing form has saved a lot of time and eliminated errors in manufacturing specifications. It has relieved workmen of reading complicated drawings. And it has contributed largely to greater operating efficiency and steady flow of proper parts to assembly.

For each piece of furniture the engineering department first prepares full-sized working drawings from designers' sketches. From these drawings a master specification sheet is prepared showing all construction details. All machining operations also are listed in their proper sequence. The component parts are numbered consecutively for easy reference.

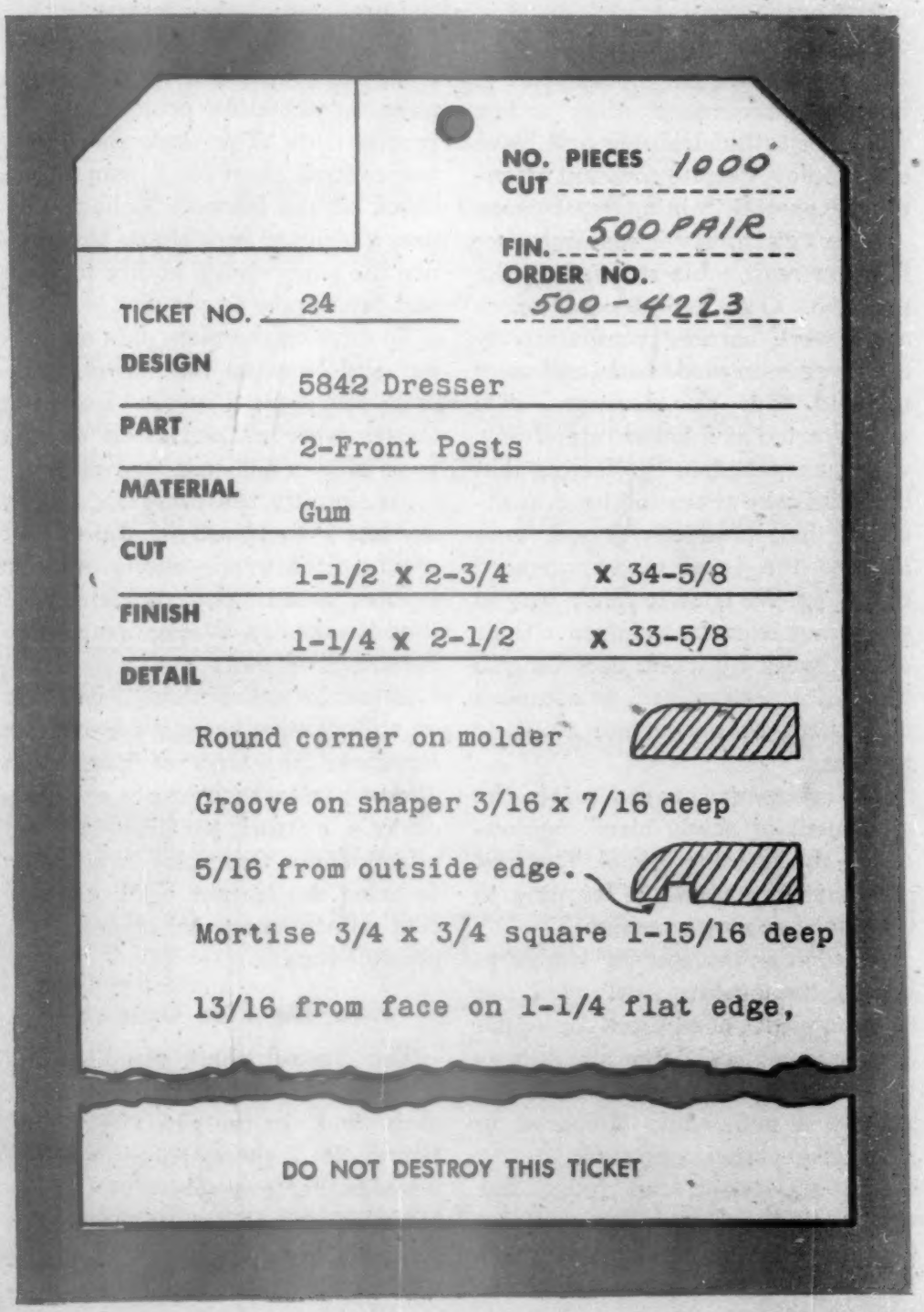
One Card for Each Part

When an order for a new model is received from the sales department, it is assigned a work order number by the engineering department. This department puts the job into production by filling out a set of route cards. One card, 4½x8 inches (see illustration), is used for each part. Specifications are copied from the master sheet.

The number of pieces required and the order number are entered *in pencil* in the upper right-hand corner of the card. The remaining information—ticket or part number, design number, name of part, material, cutting and finished sizes, and so on—is *permanently* entered in ink or type. On the reverse side of the card an easy-to-read, three-dimensional shop sketch of the piece is drawn in ink with all the necessary working dimensions.

Each route card follows the part through the woodworking plant to the assembly department. After assembly operations are completed the cards are placed in collection boxes. Once each week they are returned to the engineering department, which sorts them according to design, and, after all cards of one set have been collected, files them.

When another production run of the same design is ordered, the original cards are used again. The pencil figures at the top of the card are erased and the new data are inserted. Also, the master sheet is checked for interim changes. This simple routine is repeated for all subsequent orders.


NO. PIECES 1000
CUT
FIN. 500 PAIR
ORDER NO. 500-4223
TICKET NO. 24
DESIGN 5842 Dresser
PART 2-Front Posts
MATERIAL Gum
CUT 1-1/2 x 2-3/4 x 34-5/8
FINISH 1-1/4 x 2-1/2 x 33-5/8
DETAIL
Round corner on molder
Groove on shaper 3/16 x 7/16 deep
5/16 from outside edge.
Mortise 3/4 x 3/4 square 1-15/16 deep
13/16 from face on 1-1/4 flat edge,
DO NOT DESTROY THIS TICKET

ROUTE CARD gives all information needed to process any single part of an order. Other side of card (not shown) bears an easy-to-read working drawing

INCENTIVE PLAN FOR LEARNERS REDUCES TURNOVER

When trainees quit, the company loses. Incentive plan pays learners for output over standard, encourages them to stay

KURT A. METZGER • CHIEF INDUSTRIAL ENGINEER, MAIDEN FORM BRASSIERE COMPANY, INC., BAYONNE, N. J.

EXCESSIVE labor turnover is one of the major headaches in industry today. This problem at Maiden Form is further complicated by the fact that it requires four months or more to train a learner to become a fairly proficient sewing machine operator. Experience has shown that many new employees tend to become discouraged after a few weeks of initial training and leave our employ, despite constant attention by special training supervisors.

After extensive research, we found a reasonable solution to the problem. Our experienced operators were earning comparatively high wages on piecework, and were satisfied. But our learners, who were started at a lower rate of pay, soon succumbed to the feeling that it would take them too long to increase their productivity and earnings to the level of experienced operators. We tried to find a way to encourage learners to improve their output week by week, according to a definite pattern, and to compensate them in proportion to their progress.

The program starts with the placement of newly hired employees in the training school. The first few days are spent in learning to operate a sewing machine.

As soon as the learner is able to control the machine fairly well, she is given pieces of material for actual sewing practice. After she knows how to handle these materials, the trainee is sufficiently prepared to start on an actual operation.

The supervisor can judge her ability to coordinate her motions, her accuracy, and to some extent, her speed. Taking all these factors into consideration, he can select the job for which she is best suited.

After several days, the trainee is transferred to a regular operating department and introduced to the learner incentive plan. Details are explained by a personnel counselor, whose main function is to follow up the progress of each learner.

At that time, the learner receives a copy of the control chart. It has a payment schedule printed on the reverse side. The supervisor uses the control chart as a cumulative check on the learner. Management uses a series of such charts to measure the supervisor's ability to train and retain new employees.

To develop the plan, data on output and learning time were gathered for several years. Learning curves were established on the basis of over 500 case studies.

To simplify the program, it was necessary to classify hundreds of sewing machine operations into four groups, based upon the length of time it takes an average learner to become proficient.

Since the entire plant is working on an incentive basis, we are in the fortunate position of having an almost perfect measure of each operator's actual performance and effectiveness. Our immediate aim is to bring the learner up to 100 per cent effectiveness in the shortest possible time.

How the Plan Operates

The control chart establishes a separate quota for production in each week. In the case illustrated, Group No. 1, the learning period is 9 weeks. For example, a girl in the fifth week has a quota of 70 per cent of standard to attain; in the sixth week, 80 per cent. If she meets the quota, she is paid for 100 per cent operation. If she fails to meet the quota, she is paid her guaranteed minimum. The quota is graduated from 40 to 100 per cent over the 9-week period.

If the girl should exceed her quota by one or more weeks, she is paid according to the rating in the payment schedule. For instance, an operator's quota in the fifth week is 70. If in that week she produces 95, the quota for the eighth week, she has exceeded her quota by 3 weeks and is therefore paid 115 per cent, or 5 per cent per week.

The latter phase of the plan was developed after it was found that some operators were capable of exceeding quotas, but had no incentive to do so.

Costs and Benefits

This plan may seem rather expensive at first glance. However, it must be remembered that it costs as much as $200 and more to break in a learner. This investment represents a total loss if a new employee leaves after we have spent weeks in giving her basic training.

It is also worth mentioning that we have gained other benefits from the plan. Union officials feel that the procedure is fair to their future members, and have cooperated by helping sell the idea to employees.

The learner incentive program has helped us to plan production, since we are now in a position to predict, with a fair degree of accuracy, what the addition of trainees will mean in terms of actual output on a week-to-week basis. During the past few years we have opened several new plants and have used the learner incentive plan extensively to train green help.

The plan constitutes an important means of encouraging new workers. In addition, it provides adequate compensation for the adjustment necessary during the training period. By using it we have been able to reduce labor turnover to a minimum, by attacking it at the weakest point—the learner.

CONTROL CHART FOR LEARNER INCENTIVE PLAN

CLOCK NO. 3500 NAME Mary Smith

DATE STARTED ON OPERATION 10/29/47

" " " PLAN 11/3/47 CASE NO. 75

OPER. NO 20 STYLE 9500 CLASS I SUPERVISOR Jane Doe

WEEK NO.	1	2	3	4	5	6	7	8	9
WEEK ENDING	11/8	11/15	11/22	11/29	12/6	12/13	12/20	12/27	1/3
QUOTA IN PER. CENT	40	50	55	60	70	80	85	95	100
HOURS PER DAY	3.2	4.0	4.4	4.8	5.6	6.4	6.8	7.6	8.0
PERFORMANCE	HRS.	HRS.	HRS.	HRS.	HRS.	HRS.	HRS.	HRS.	HRS.
MONDAY	3.0	3.8	4.2	5.0	6.0	7.0	7.0	7.6	8.0
TUESDAY	3.0	4.0	4.6	4.6	6.4	6.6	6.8	7.0	7.8
WEDNESDAY	3.2	3.8	4.8	4.4	6.6	6.8	7.2	6.8	8.2
THURSDAY	3.4	4.4	4.4	5.2	6.2	7.2	7.0	7.2	7.6
FRIDAY	3.4	4.2	4.6	4.8	7.0	6.4	6.4	7.0	8.4
SATURDAY	3.2	4.6	-	5.4	-	7.0	-	7.2	-
TOTAL HRS. EARNED	19.2	24.8	22.6	29.4	32.2	41.0	34.4	42.8	40.0
TOTAL HRS. ATTEND.	48	48	40	48	40	48	40	48	40
PER CENT EFFICIENCY	40	52	56	61	80	85	86	89	100
PAY PERCENTAGE	100	100	100	100	105	105	100	89	100

CONTROL CHART SHOWS NEW WORKERS HOW MUCH THEY ARE EXPECTED TO PRODUCE. OUTPUT OVER STANDARD EARNS BONUS

FIRST THEY LEARN HOW TO OPERATE A SEWING MACHINE

PAYMENT SCHEDULE

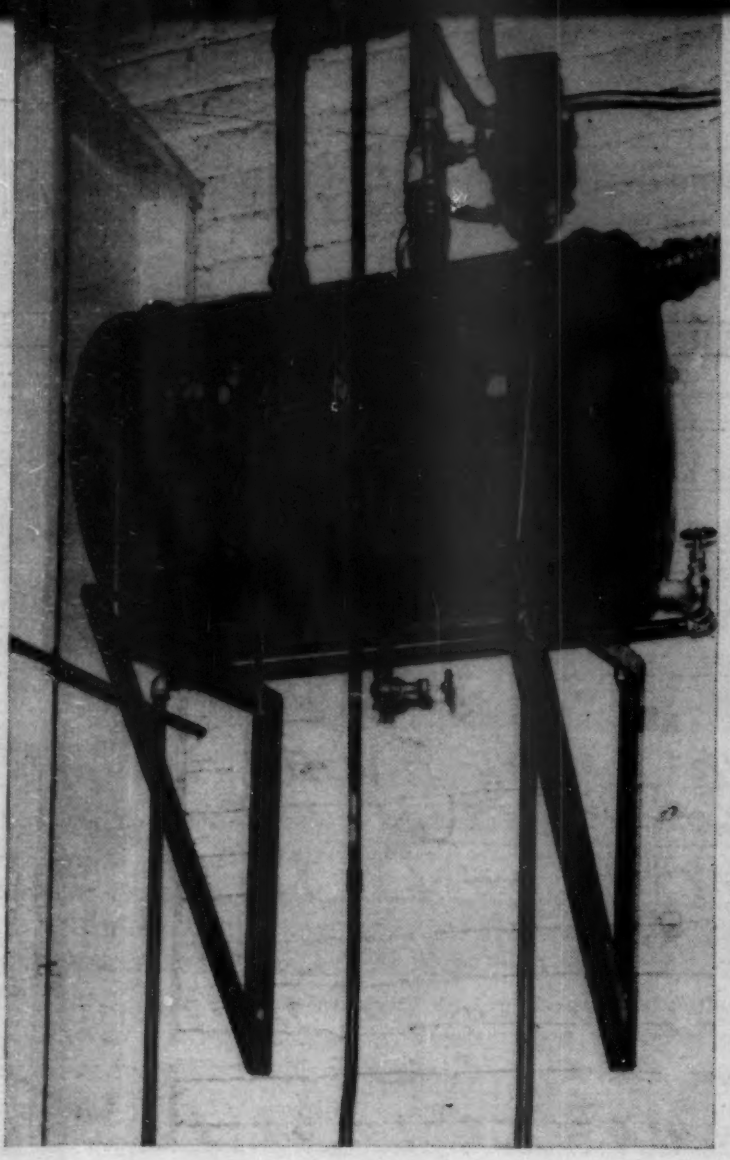
For first three weeks on plan:

If quota is equaled or exceeded — Pay 100%

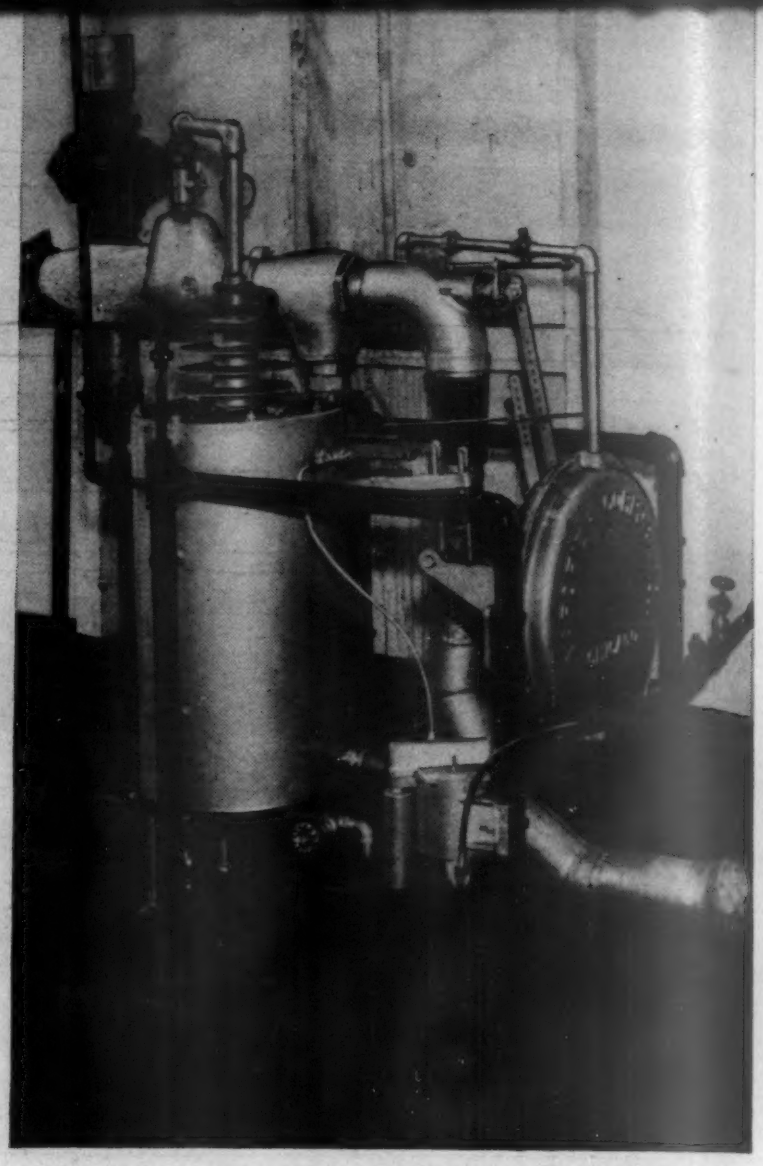
After three weeks on plan:

If quota is equaled	Pay 100%
Quota exceeded by 1 week	" 105%
" " " 2 weeks	" 110%
" " " 3 weeks	" 115%
" " " 4 weeks	" 120%
" " " 5 weeks	" 125%
Any weeks over 5 weeks	" 125%

COMPLETE PAY INFORMATION LEAVES NO ROOM FOR ARGUMENT



FUEL OIL DRAWN FROM AN INTERMEDIATE SUPPLY TANK. . .



FLOWS THROUGH A SMALL PIPELINE TO A VAPORIZING UNIT;

STANDBY EQUIPMENT RELIEVES

No longer does this company have to fear gas shortages. Gas-generating equipment is ready to stand by in case of need

RALPH R. TODD • FACTORY MANAGER, APEX MANUFACTURING COMPANY, CLEVELAND

SHORTAGE of fuel gas caused by a series of severe cold waves. Normal fuel gas supply from the public utility cut drastically. Impossible to continue plant operations during the gas famine.

These were the crushing obstacles faced by Ohio industry during the winter of 1946-1947. Reluctantly Apex management was forced to post the following notice to its employees:

"The East Ohio Gas Company notified us this morning that it would be necessary again to shut industrial plants down because of the lack of gas. They have allowed us to work through the morning and will give us enough gas to keep our pipes from freezing, and no more.

"Therefore the plant will close at 11:30 today, and each employee will be notified by wire or telephone, or both, when we can open again. Wires have already been sent to the two night shifts, but if you can pass the word along to those shifts, it will be a help.

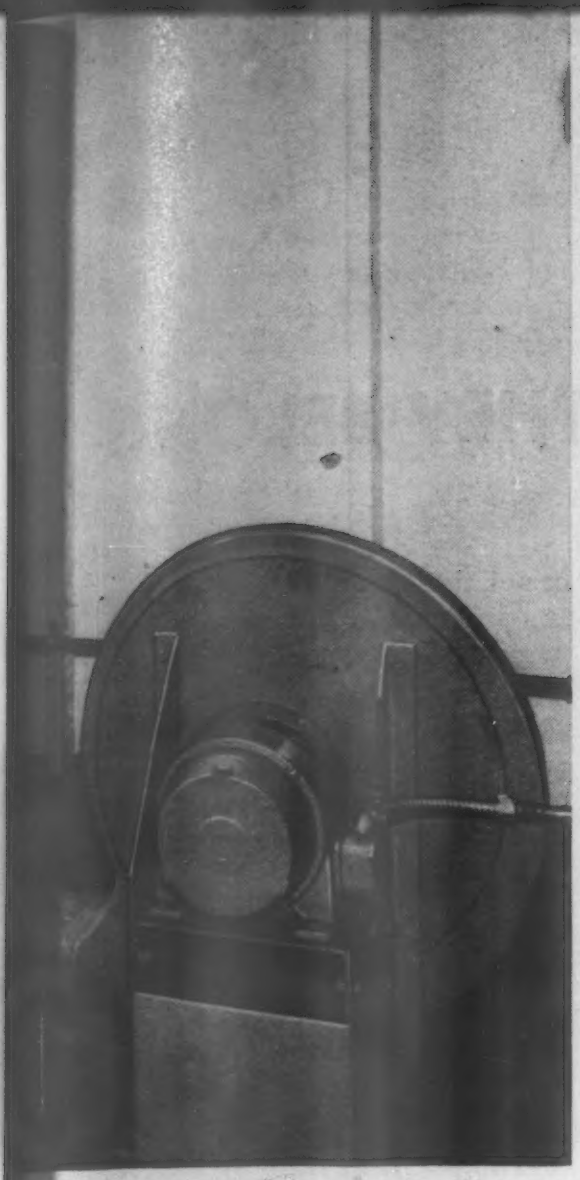
"This condition is one that is completely beyond the company's control and cannot be avoided."

This was only one of several similar notices of forced layoffs of more than 1000 Apex employees. The major cost of these shutdowns to the company was in the attendant loss of production. Other company losses included the salaries of monthly paid employees. In addition, the loss of pay to hourly workers had serious aspects.

Investigation was promptly begun to determine the likelihood of the repetition of such fuel shortages in the future. It was revealed that shortages of gas heating fuel were likely to occur for an indeterminate time. Also, heat from fuel gas was found to be a prime necessity in carrying on bonderizing, painting, and plating operations, as well as office work.

The System

As a result of these studies, plans were made for the installation of standby gas-generating equipment. It was decided to purchase seven individual oil-vaporizing units which would provide the necessary heating gas at the points desired. No changes in the processing units themselves would be needed.



FROM HERE THE OIL VAPOR IS BLOWN . . .

INTO STANDBY GAS MAIN TO BURNER WHICH IS READY TO TILT INTO PLACE

FUEL GAS SHORTAGE

Two 15,000-gal. fuel oil tanks, sufficient in capacity to supply all the vaporizing units for 15 days, were installed in an outside underground location. From these tanks 2-in. feeder lines were brought into the plant and terminated in seven separate 20-gal. gravity-feed tanks which were installed to supply oil to each unit.

Quantity of fuel oil pumped from the supply tanks to each of the smaller gravity-feed tanks is controlled by an electronic valve.

To Vaporizing Unit

From the gravity-feed tanks the oil flows through a ½-in. pipeline to a float valve, and then to the heating chamber of the standby vaporizing unit. The float valve maintains a 1-gal. level in the heating chamber at all times. Here the oil is vaporized, at first by application of pilot heat, and later by self-generated heat. A syphonic-action blower forces the vaporized oil at low pressure (24 ounces) from the heating chamber through a gas main to a discharge nozzle. This nozzle is located adjacent to the regular fuel gas nozzle at the processing unit. It is so arranged that either nozzle can be swung aside and the other swung in its place as the need arises.

When a gas shutdown is imminent, the fuel gas pilot of the heating chamber of the standby unit is lighted, the regular gas nozzle is pulled aside, and the vaporized oil nozzle is pushed into position. After a short warm-up period the vaporized oil mixture is then ignited, and from then on heat is provided from this source.

Each standby unit consumes 14 gallons of No. 1 fuel oil per hour and produces about 2 million B.t.u. per hour. All seven units of the system can be put into operation in less than 2 hours.

How Much It Cost

The original cost of the installation was $30,000. This sizable figure fades into insignificance, however, when considered in the light of the actual losses sustained during the shutdowns necessitated by fuel gas shortages. So does the extra fuel cost of approximately $25 per day. Should such gas shortages continue in the future, and present prospects show no relief for several years, the installation is expected to pay for itself many times over.

For this reason equipment of approximately the same capacities and for similar purposes has since been installed at the company's division in Sandusky where gas shortages in 1946-1947 had similarly caused plant shutdowns or curtailment of production.

LET'S MAKE WORKERS FEEL THEY BELONG

Not an easy job. But it can be done. Here, for example, are successful techniques one company is using

H. G. BATCHELLER • PRESIDENT, ALLEGHENY LUDLUM STEEL CORPORATION, PITTSBURGH

Two of the most widely discussed topics about post-war industry have been insufficient production (including strikes and lower man-hour productivity) and the relations between manager and worker.

Too many times, each of these topics has been considered without relationship to the other. Yet a look at the companies crying loudest about labor unrest and lower productivity shows almost unfailingly a bad feeling or a lack of understanding between management and labor. And a still closer examination of those companies reveals, at the root of the situation, a de-personalization of work and worker to the extent that the individual has lost his personal feeling of identity with his company and its product.

There is no doubt that mass production techniques have revolutionized American industry. All of us are proud of this mass production. It provides us with a standard of living undreamed of anywhere else in the world. We are proud of the products, but we are ashamed of the byproducts—such as the transformation of labor from craftsmanship to rote, from pride of achievement to listless nonentity. Whether we wish to acknowledge it or not, this starvation of worker ego is a prime factor in labor's dissatisfaction, dissension, and willingness to be led into slowdowns and strikes.

According to a *Fortune* survey, nearly half of the nation's factory hands are not enthusiastic about their work—29 per cent consider their jobs just "all right," 14 per cent think their work dull, and 5 per cent are undecided. Other surveys show that as workers' opinions of their jobs go down the scale, so goes mass opinion of industry, its policies, profits, and management.

The easy way out is to describe this job de-personalization and its aftereffects as a necessary adjunct to our modern industrial system. We can go ahead with the knowledge that our system is so good that we can out-produce any country in the world despite individual worker

HILAND GARFIELD BATCHELLER

Like many another industrial executive, Hiland Garfield Batcheller held down two jobs during the war. One at Allegheny Ludlum Steel Corporation. The other at WPB where first he was director of the steel division and later vice-chairman and chief of operations.

Born in Brooklyn, he was educated at Glens Falls Academy, Glens Falls, N. Y., and Wesleyan University, Middletown, Conn. In 1909 he entered the sales department at Carnegie Steel Company, stayed with that organization until 1915. Became assistant to the president of Ludlum Steel Company that same year, was promoted to vice-president in 1918, to executive vice-president in 1925, to president in 1930. Following consolidation with Allegheny Steel Company, he became president of the new corporation.

During the war he served as consultant in the Army and Navy Munitions Board, and as a member of the Civilian Consultant Committee, the Alloy Steel Committee, and committees of OPM and WPB, Army Ordnance Association, and National Aeronautic Association. He is also chairman of the Combined Steel Committee of the United States, United Kingdom, and Canada

apathy or lack of job satisfaction. But the real need is to tackle the problem with the same vigor and thought that industry gives other and often less important enigmas.

There was a time in America when the boss owned the works and ran them. He knew his workers personally, and their problems. They knew him, and they knew his business. They had a real pride in their jobs and their company, and got deep satisfaction from their craftsmanship. The crux, then, is to make it possible once again for the worker to feel that he is a part—a necessary part—of his company and to obtain the satisfaction of accomplishment from his labor.

Many companies throughout the nation are now taking remedial action. Correctives vary as widely as the companies themselves. Our company's activities in this direction have had a high priority for many months, and, while we have yet to achieve complete success, our efforts have been richly rewarded.

At the very outset, we realized that our program would have maximum effect upon our workers only if we used every possible approach. We knew it was necessary to talk to our employees directly, but we knew also that we should have to reach them through their friends and neighbors, through local newspaper publicity and advertisements, through booklets, posters, ministerial associations, and civic and social groups.

Before we started our program, we attempted to find out what our employees and their neighbors thought about us.* We were amazed at the findings. Our own surveys, and those made by independent organizations, showed that both worker and neighbor not only lacked information, but actually possessed much misinformation and misunderstanding. The company was receiving discredit in many instances in which the highest credit should have been given.

As an example, one of our community surveys showed that only 27 per cent of the people had any idea about how much money our plants brought into the community. Seventy per cent thought our wage scales were lower than they are. Forty-eight per cent thought our profits were much higher than they are. Seventy-six per cent thought a fair profit was much higher than we had ever made, and yet they thought we were profiting too greatly.

Taking this information and that received from other surveys, we set about on a campaign to explain to the workers and the people of the communities in which they lived, facts and figures about our company upon which they were misinformed or uninformed.

To get our message across we knew that we needed something that would attract their interest and arouse their imagination, but something that was honest and something that we lived in our day-to-day operations.

We decided upon a program based upon these four principles:

1. We have a sincere high regard for our employees and the communities in which they live.
2. We pay good wages.
3. We make fair profits.
4. We want to prevent "boom and bust."

These four factors gave us a vehicle through which we were able to explain the principal facts about our operations, our aspirations, and our financial structure.

There is no doubt that mass production techniques have revolutionized American industry. All of us are proud of this mass production. It provides us with a standard of living undreamed of anywhere else in the world. We are proud of the products, but we are ashamed of the byproducts—such as the transformation of labor from craftsmanship to rote, from pride of achievement to listless nonentity. Whether we wish to acknowledge it or not, this starvation of worker ego is a prime factor in labor's dissatisfaction, dissension, and willingness to be led into slowdowns and strikes . . .

PHASE ONE

The first phase of the campaign was executed during a 2-week period in communities in which the company operates its principal plants. During the first week, plant managers called meetings of their entire supervisory forces and gave them all the information, illustrations, etc. Particular care was taken to draw the foremen into the campaign. Instead of treating them as outsiders not good enough to sit in the seats of management and too good to associate with the hourly worker, foremen were brought into management counsel and given the duty of taking our message directly to the men under them.

During the second week, an elaborate program was arranged consisting of meetings of "thought leader" groups in each community, widespread newspaper publicity and promotion, advertising, booklets, and posters. At the "thought leader" meetings, because it was impossible to invite everyone in a community, invitations were sent to business leaders, professional leaders, local union officials, ministers, priests, rabbis, and educators. Letters of invitation to these meetings went out over the signature of the plant manager in each community, and a meeting place away from the plant was selected.

At each meeting the president of the company and his entire executive staff were present.

Simplified charts, graphs, and other illustrations were used to accentuate the main points covered in the main address, which was an exposition of the four previously mentioned principles. The company's financial report was explained with exceptional effectiveness. This was done by ignoring accountants' terms and language

* "Selling the Company to the Community," FACTORY, April, 1947.

There was a time in America when the boss owned the works and ran them. He knew his workers personally, and their problems. They knew him, and they knew his business. They had a real pride in their jobs and their company, and got deep satisfaction from their craftsmanship. The crux, then, is to make it possible once again for the worker to feel that he is a part—a necessary part—of his company and to obtain the satisfaction of accomplishment from his labor. . .

and dividing the statement into three main groups:

Taken in. All money received for products manufactured and sold, and services rendered.

Paid out. Costs of materials, supplies, power, wear and tear on equipment, and other costs (excepting wages and salaries) to make and sell our products.

State, local, and federal taxes—income taxes, Social Security, etc.

Paid to employees—wages and salaries.

Paid to elected officers.

Paid in dividends to our 13,000 owners whose buildings, machinery, and money we are using.

Plowed back. Left in the company so it can grow and prosper, buy new equipment, provide new jobs, and carry on in hard times.

Since most of the people in the communities were used to thinking of finances in terms of weekly take-home pay, we further simplified our statement by breaking down the annual amounts on a basis of the average amount per employee-week worked.

At the conclusion of the main address, the meeting was thrown open to questions from the floor, and every question asked was given an honest answer.

As our friends left the meetings, we gave them a booklet recapitulating all points that had been covered in the address.

Simultaneously with our meetings, we ran a series of five full-page newspaper advertisements in all local papers, again explaining our program. Widespread newspaper publicity, strong editorials, and a flood of letters left no doubt but that we were on the right track.

With that start, we were able to retain the confidence of our workers and their neighbors through a program designed to explain our operations on a day-to-day or current basis. And with the incentive of the program's inauguration, manager and employee alike have cooperated in fostering the program.

For instance, in one plant town, the plant management and workers have followed through like this:

1. Sponsored an employee blood bank to which only employees contribute, but which is for the benefit of the entire community.

2. Bought historical letters and presented them to the local library.

3. Arranged plant tours and annual dinners for high school athletic squads.

4. Participated in a radio clinic on engineering courses for high school students.

5. Set up an annual plant tour for local industrial groups.

6. Arranged exhibits of plant products and merchandise made from those products for the benefit of both worker and townsfolk.

PHASE TWO

The second phase of the long-range program took the form of a special report prepared for the employees and their friends. As the spokesman for this report, we created "Al," an animated figure patterned after the company's long-established star trademark. Al introduced himself as all of the men and mills of the company. He said he was both worker and owner, metallurgist and manager, steel worker and salesman. He proceeded, in 18 pages, three-quarters of which were cartoon illustrations, to tell what had happened to him in the past year, and what he expected in the immediate future. In closing, he offered to send the formal annual report to any who requested it.

A survey, conducted by an independent organization a month after the report was delivered, undertook to find its effectiveness by making a door-to-door canvass of a portion of those receiving it. This survey showed that 85 per cent of the recipients read, remembered, and liked the report. About 20 per cent of those questioned did not believe some of the statements Al made. For instance, they did not believe his statement that the average hourly worker in the company was paid $1.46 per hour. This disbelief we think was caused by passing over that portion of the report too lightly, by not explaining that some of the workers got a great deal

The easy way out is to describe this job de-personalization and its aftereffects as a necessary adjunct to our modern industrial system. We can go ahead with the knowledge that our system is so good that we can out-produce any country in the world despite individual worker apathy or lack of job satisfaction. But the real need is to tackle the problem with the same vigor and thought that industry gives other and often less important enigmas. . .

HI NEIGHBORS! HERE'S AL AGAIN!!

IT'S NOT REALLY NECESSARY for me to introduce myself since you've known me all your lives — and most of mine. Of course, some of you might be seeing me in my present form for the first time — so maybe I'd better tell you a little about myself.

I'm Al. I'm all the men and all the mills of Allegheny Ludlum Steel Corporation. I'm 12,639 workers, about half of whom are your friends, relatives and neighbors who work

SPOKESMAN for Allegheny Ludlum management is an animated figure based on company trademark. He has been used effectively in reports to workers and (above) in "A Visit to Brackenridge With Al!" which was distributed at a recent open house

more and some less than the average amount. Those who received less, naturally would think there is something wrong with the statement, unless it was explained.

PHASE THREE

The third phase of the program, now in progress, consists of a series of open-house visits for families and friends of the employees. This is designed to give the community a better insight into working conditions, plant safety, and so on, and give the workers themselves a chance to show off while on the job.

In our first open house, held at Brackenridge, Pa., the results were very satisfactory. For instance, in a stainless sheet department, the department superintendent was of the opinion that it would be impossible to accommodate visitors in an already crowded building without seriously affecting operations. However, despite the fact that a 7-ft. aisle was made through the building and more than 10,000 people passed through in less than 12 hours, production in the department did not suffer. The workers discovered a real pride in their work and showed it by putting on a demonstration of skill and workmanship for their visitors.

The open house was made thematic with Al serving as host. He authored a tour booklet explaining the different departments. An actor in an Al costume greeted the visitors, and cutouts of him held signs further explaining points of interest.

Everything from scrap and slag to furnaces and mills was identified with placards. Necessity of ownership was emphasized by calling attention to the initial and operating expenses necessary for such an undertaking.

While additional phases of the program are planned for the immediate future, the company is attempting to move forward step by step, carefully analyzing conditions and requirements before final program decisions are made.

Meantime, however, the chain-of-command technique is used to keep employees informed of activities, and every cooperation is given to the local press in informing community people.

The plants have management bulletins covering activities in the individual plants. Another series of bulletins to management and salespeople serves as a medium for top management decisions and activities on a company-wide basis, and the employee magazine is used for editorial, news, and personal purposes.

★ ★ ★

Dealing almost wholly with intangibles, a dollar-and-cents return on the company's investment is difficult or impossible to calculate. We are sure that worker attitudes have improved. We believe that community feeling toward the company is at its highest level. And we cannot foresee management-worker strife brought about from within the company itself.

BRACKET CASTINGS ARE NOW RECEIVED IN COLLAPSIBLE WIRE CONTAINERS, ARE READILY MOVED TO STORAGE AND TIERED. . .

BETTER HANDLING NETS

Collapsible containers for bracket castings, rack trucks for stators, pallets for motors—save $6200 a month

G. R. KEPNER and W. T. PRESS* • WESTINGHOUSE ELECTRIC CORPORATION

RECENT reorganization of handling methods for bracket castings, stators, and finished motors at the Westinghouse Small Motors Division, Lima, Ohio, has resulted in a 98 per cent reduction in components made effective by excessive handling, and a saving in handling costs of $6200 a month. The improved handling has been brought about through the use of collapsible containers, rack trucks, and pallets.

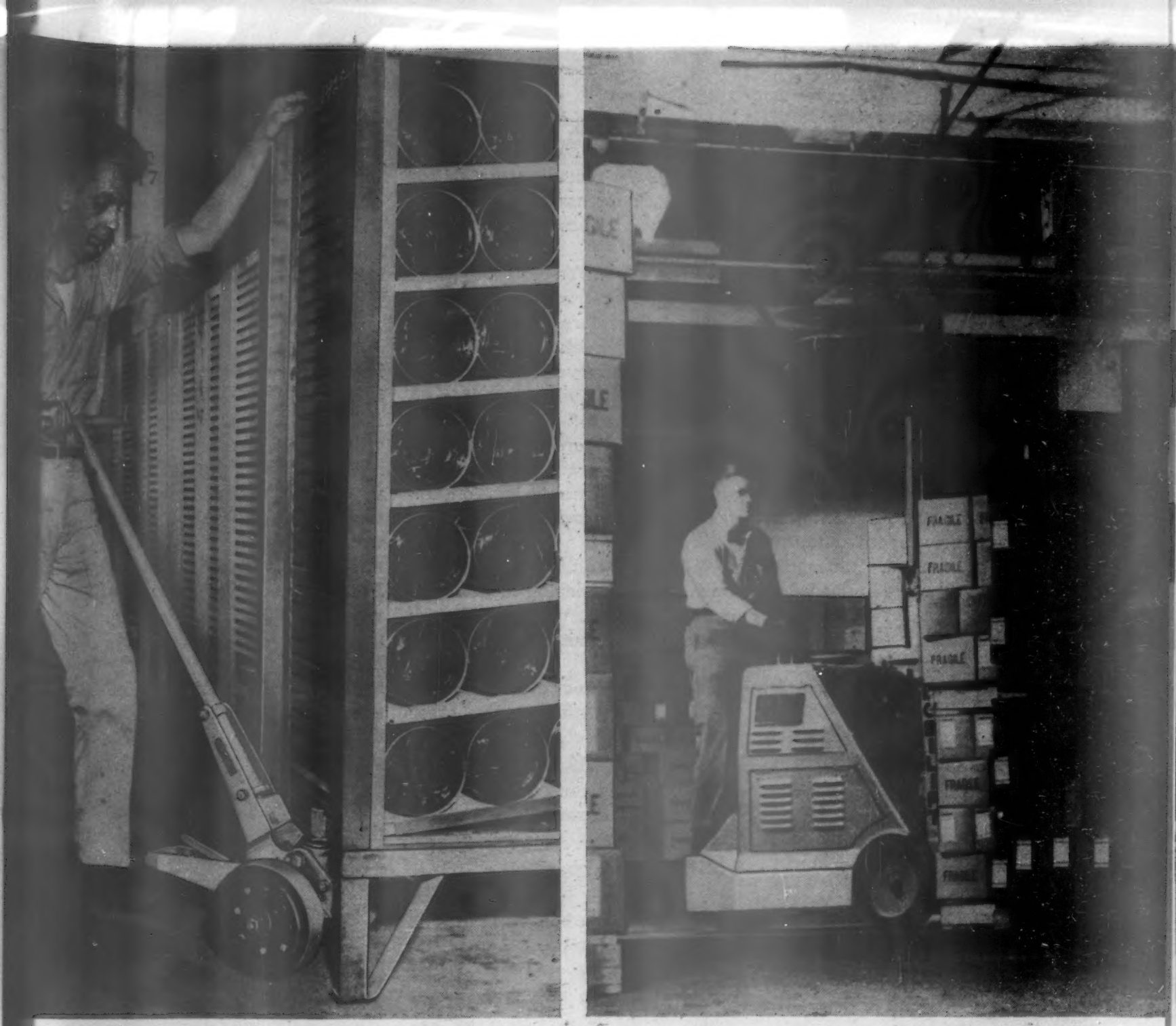
In addition to savings in dollars and cents, numerous intangible savings in the form of better housekeeping, elimination of time lost hunting material, and better working conditions have added to plant efficiency.

The change to better methods was brought about by an alarming increase in defective material both in receipts from suppliers and through excessive handling during the manufacturing cycle.

Renovating the handling system proved most advantageous. It has:

1. Permitted the use of larger

* G. R. Kepner is Director, Headquarters Production, Pittsburgh, and W. T. Press is Supervisor, Receiving, Stores, and Shipping Department, Lima, Ohio.



WHILE SPECIALLY DESIGNED RACK TRUCKS FOR STATORS AND PALLETS FOR FINISHED MOTORS MINIMIZE THE HANDLING JOB

IMPORTANT SAVINGS

stacking and shipping units, eliminating handling of individual pieces.

2. Reduced loss from spoiled work and damaged goods.

3. Simplified taking of inventories; permitted counting of containers, racks, pallets, instead of individual pieces.

4. Facilitated meeting delivery dates on rush orders.

5. Permitted systematic routing and dispatching.

6. Placed no restriction on layout changes or operation sequence.

7. Reduced accidents.

8. Not limited to operations to within one building or bay. If necessary the division's entire material contents may be removed from the plant without having to handle any piece by hand.

BRACKET CASTINGS

Old Method. Under the old system a rigid skidbox container was moved by electric truck to the freight car in which bracket castings were received from the foundry. The castings were (1) picked up one at a time, (2) laid in the skidbox, (3) transported by electric truck to the storeroom, (4) picked up from the skidbox container one at a time, and (5) piled in wooden bins. This method required one man working 48 hours to unload a railroad car containing 19,000 pieces.

When the castings were needed for manufacturing they were removed from the bin one at a time and laid in the skidbox container again to be transported by electric truck to the first operation.

New Method. Excessive handling has been eliminated by receiving

castings in collapsible wire containers, and keeping them there during subsequent movement to point of use. An electric truck picks up a container of castings from the freight car and transports it to temporary storage adjacent to the unloading dock. The same number of castings, now handled as unit loads, can be unloaded from a railroad car by one man in 3½ hours. The containers themselves collapse to save shipping space on the return to the foundry.

The old wooden bins have been removed, and the floor area they occupied now is used for tiering receipts, container upon container, until they are needed. Tiering has resulted in a decrease in floor storage requirements of at least 50 per cent.

Savings. The handling cost for the old method was approximately $41 per car of castings. For the new method it is approximately $6 per car—a saving of $35 per car. Additional benefits are:

1. Ease of handling for supplier (cleaning room direct to shipping dock).
2. Breakage, if any, charged back to supplier (breakage eliminated at receiving end).
3. Demurrage on freight cars eliminated.
4. Receipts weighed for better inventory and accounting (bin storage necessitated piece count).
5. Increased utilization of time of productive machinery and operators because (a) delays in delivery of work are avoided; (b) work is placed in position to prevent needless rehandling; (c) waiting time between jobs is cut.

STATORS

Old Method. Another problem encountered in the general materials handling improvement program was moving stators. Under the old method a wooden *V* truck was loaded with stators at the final processing operation and the truck pushed to the storeroom to be unloaded, one stator at a time. There a stackboard was placed on the floor, its entire area covered with stators, and another stackboard placed on top until the stators were stacked ten high. From the fifth layer up two men were required for stacking. In removing the stators from stock for assembly, the procedure was reversed.

New Method. To eliminate waste motions, rack trucks were introduced. Operators now load each tier of a rack truck until filled. The truck is then moved into stores by the storekeeper, who spots it in an assigned area for temporary storage. When stators are needed for assembly, the rack is moved to the proper processing location and spotted within reach of the operator.

Savings. Handling the stators as unit loads and keeping them in live storage through the use of rack trucks has permitted a saving of $2360 per month.

Although no floor area was saved in this new method, many other benefits have become apparent:

1. Better quality. Under the old method tiering caused bottom stators to go out of round.
2. Piece count can be performed visually without handling.
3. Spot check inspection can be made on items at bottom of rack as well as those on top.
4. Live storage permits rotation of stock so that bottom layer no longer waits up to a year for assembly, permitting rust or dust to accumulate.

The fourth advantage, rotation, required another innovation. First, a tag is attached by the inspector to each rack of material that is ready for storage. When the storekeeper spots the rack in temporary storage, he marks the rack location on the attached tag and detaches the top copy for recording purposes. The bottom copy remains with the rack. Prior to sending the detached copy to the stores ledgers, the storekeeper transposes the following information from the tag to a filing card maintained in the storeroom: Identification, quantity, location, and date received in stores.

In filing the card in the storeroom the storekeeper checks his files to see if he has like cards for other racks of the same component.

If he does, the card he has just filled out is filed at the back of the cards already on file. When issuing a rack of components to assembly, he withdraws the front card, or the one bearing the oldest date, in all cases. In this manner the rack of components that has been stored first is used first.

FINISHED MOTORS

Old Method. The final phase of handling reorganization at Lima involved handling finished motors. Formerly a hand truck was loaded with boxed motors one at a time as they came off the end of the conveyor. This truck was pushed to the storeroom where the boxes were unloaded individually and stacked approximately ten high. From the fifth layer up two men were required for stacking. In moving the motors for shipment the boxes were removed singly and loaded on a hand truck again. The truck was pushed to the shipping dock, the boxes were removed and placed in the common carrier.

New Method. Lost motion within the storeroom was eliminated in the new method by palletizing finished motors. The packaged motors are now loaded on pallets at the end of the final assembly conveyor belt, and moved by electric fork truck to an assigned area in the storeroom where they are tiered, until accumulated for customer orders.

When motors are to be shipped, the pallet is removed from stores by electric fork truck and transported to the shipping dock where motors are placed in the common carrier for shipment.

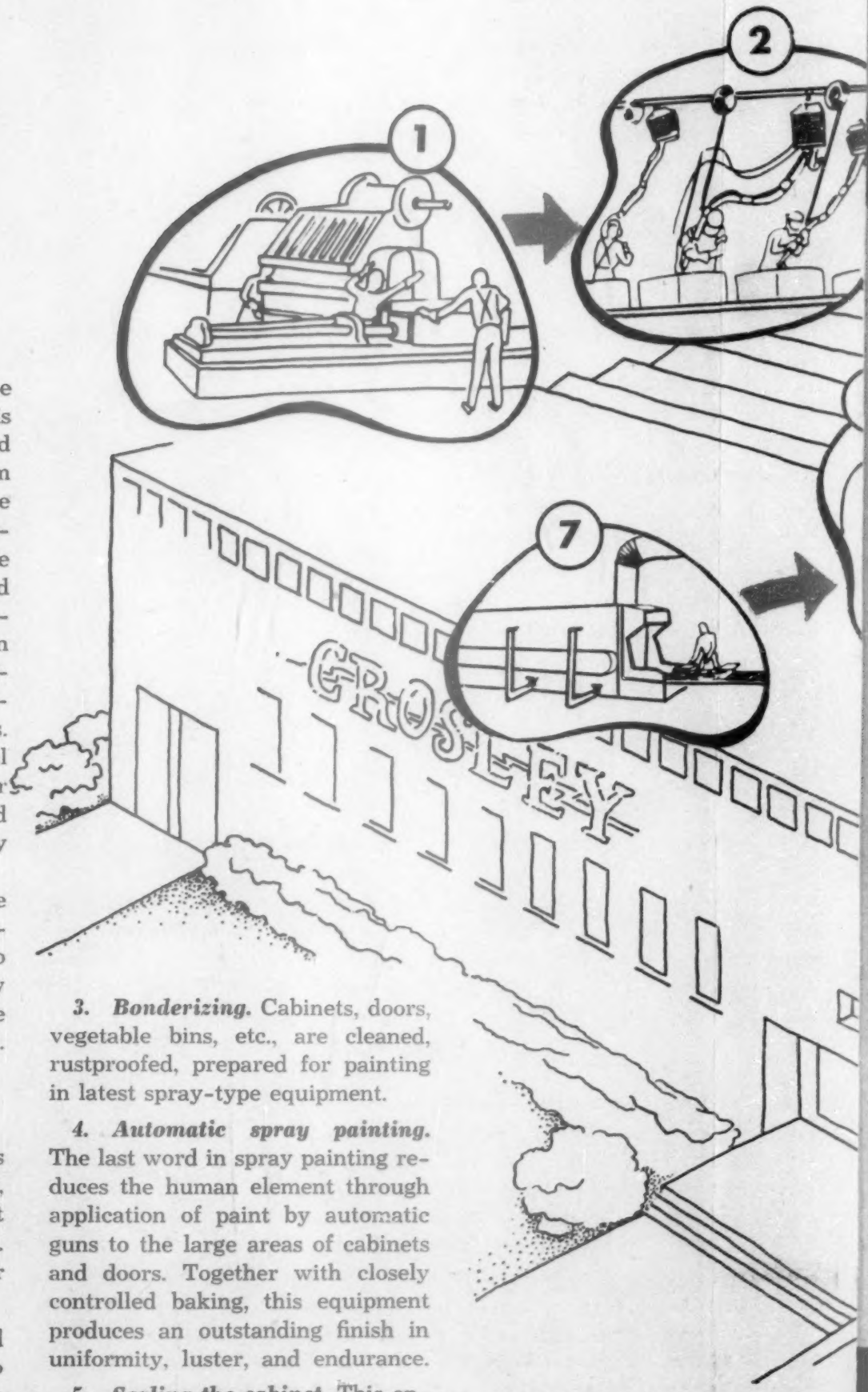
At present negotiations are being conducted with large use customers to check the feasibility of making shipments to them in palletized unit loads. Pallets would then be loaded directly into the car at the shipping dock and the customer would unload them with a fork truck. This would eliminate the need for unloading each pallet into the common carrier and reloading by customers on receipt.

Savings. Palletizing of finished motors has resulted in a saving of $1320 per month on handling cost alone over the old method of handling individual packages within the storeroom.

PRODUCTION FLOW CHARTS

2. HOUSEHOLD REFRIGERATORS

CROSLEY DIVISION, AVCO MANUFACTURING CORPORATION, RICHMOND, IND.



THE Crosley plant where the Shelvador refrigerator is built, is over a third of a mile long and laid out on a one-floor plan. Maximum efficiency and quality control are achieved by straight-line production, conveyorized movement of the product through processing, and incorporation of the latest developments in production inspection equipment. The flow chart graphically depicts the simplicity of layout for major assembly operations. Minor subassemblies flow by logical sequence into more complex major assemblies into the completed product. Backtracking is virtually eliminated.

Reference to the chart and the following brief description of operations will give more meaning to the statement that a high-quality refrigerator comes off the line every 28 seconds of the work day.

CABINET PRODUCTION

1. Press room. Flat metal sheets are cleaned, straightened, sheared, flanged, and drawn into cabinet shells of "wrap-around" design. Doors proceed through similar operations.

2. *Welding.* Back panels and interior fittings are welded into cabinets to give them one-piece strength.

3. Bonderizing. Cabinets, doors, vegetable bins, etc., are cleaned, rustproofed, prepared for painting in latest spray-type equipment.

4. Automatic spray painting. The last word in spray painting reduces the human element through application of paint by automatic guns to the large areas of cabinets and doors. Together with closely controlled baking, this equipment produces an outstanding finish in uniformity, luster, and endurance.

5. Sealing the cabinet. This operation hermetically seals the seams

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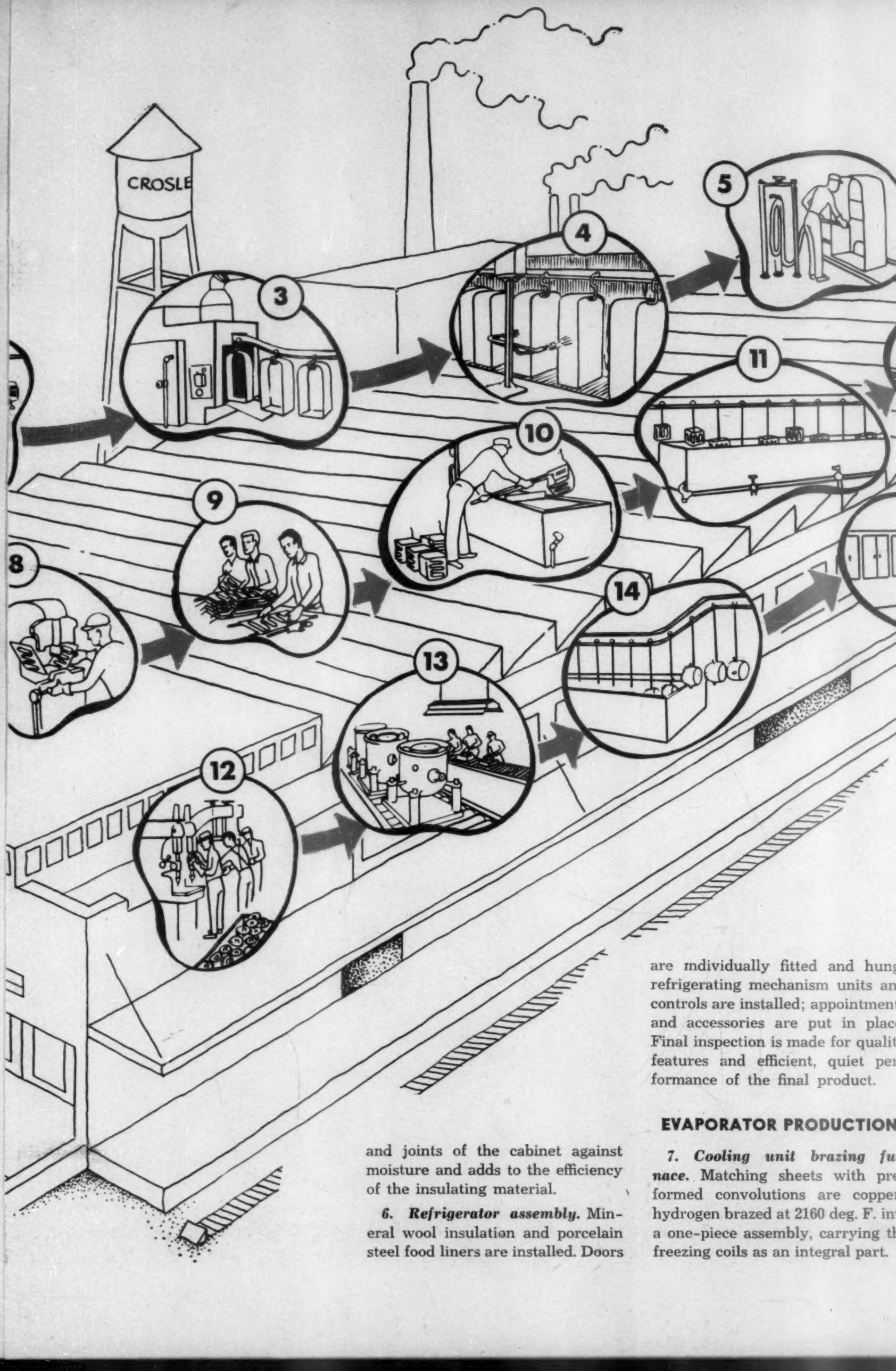


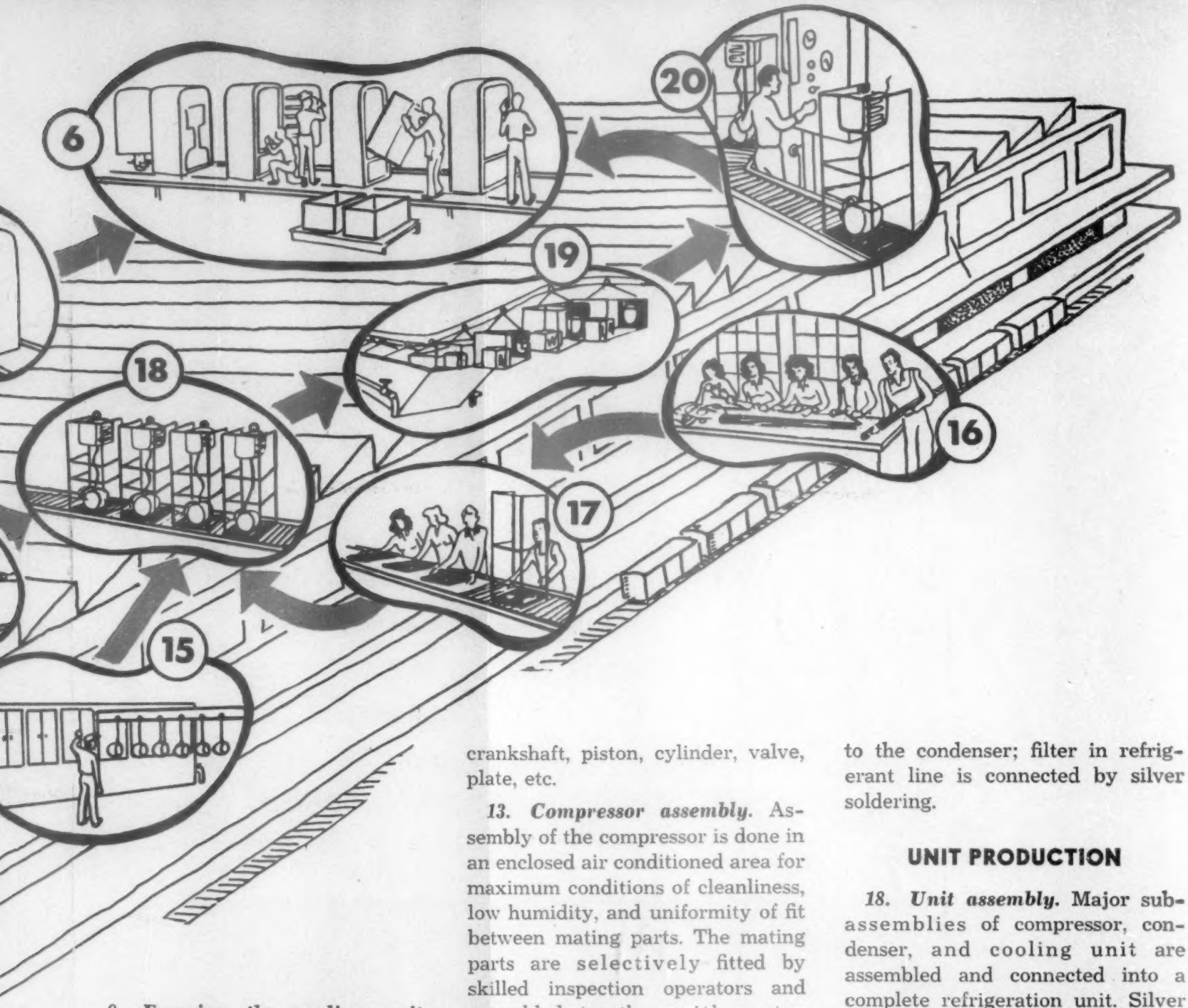
and joints of the cabinet against moisture and adds to the efficiency of the insulating material.

*6. **Refrigerator assembly.*** Mineral wool insulation and porcelain steel food liners are installed. Doors

are individually fitted and hung refrigerating mechanism units an controls are installed; appointment and accessories are put in place Final inspection is made for quality features and efficient, quiet per formance of the final product.

EVAPORATOR PRODUCTION

*7. **Cooling unit brazing fu nace.*** Matching sheets with pre formed convolutions are copper hydrogen brazed at 2160 deg. F. int a one-piece assembly, carrying th freezing coils as an integral part.



8. Forming the cooling unit. Hydraulic presses of special design form the brazed assembly into the outer shell of the cooling unit.

9. Cooling unit assembly. Dry and wet shelves (the wet shelf has tubing attached for added refrigerating surface) are installed; connections between cooling unit and wet shelf are silver soldered. A leak test at 200-lb. internal pressure follows assembly.

10. Finishing the cooling unit. Cooling unit is trued and squared for perfect fit in the refrigerator cabinet.

11. Cooling unit plating. Cooling unit is electro-plated for high resistance to corrosion and attractiveness of finish.

COMPRESSOR PRODUCTION

12. Compressor machining. Precision dimensioning and superfinishing of compressor parts, crankshaft, piston, cylinder, valve, plate, etc.

13. Compressor assembly. Assembly of the compressor is done in an enclosed air conditioned area for maximum conditions of cleanliness, low humidity, and uniformity of fit between mating parts. The mating parts are selectively fitted by skilled inspection operators and assembled together with motor windings and connections into the compressor housing. A test is made for volumetric efficiency and current consumption, and the housing is sealed.

14. Compressor leak test. The sealed compressor unit is insured against any possible leaks by internal pressure-testing under water.

15. Dehydration ovens. Residual moisture is evacuated from compressor unit by vacuum pumps during closely controlled baking period to an allowable moisture content of less than 1 milligram.

CONDENSER PRODUCTION

16. Capillary and suction tubing. Tubing is cut to length, flared, bent, and suction and capillary are jig-soldered side by side to form heat exchanger.

17. Condenser assembly. Mounting brackets are spotwelded to the condenser; filter in refrigerant line is connected by silver soldering.

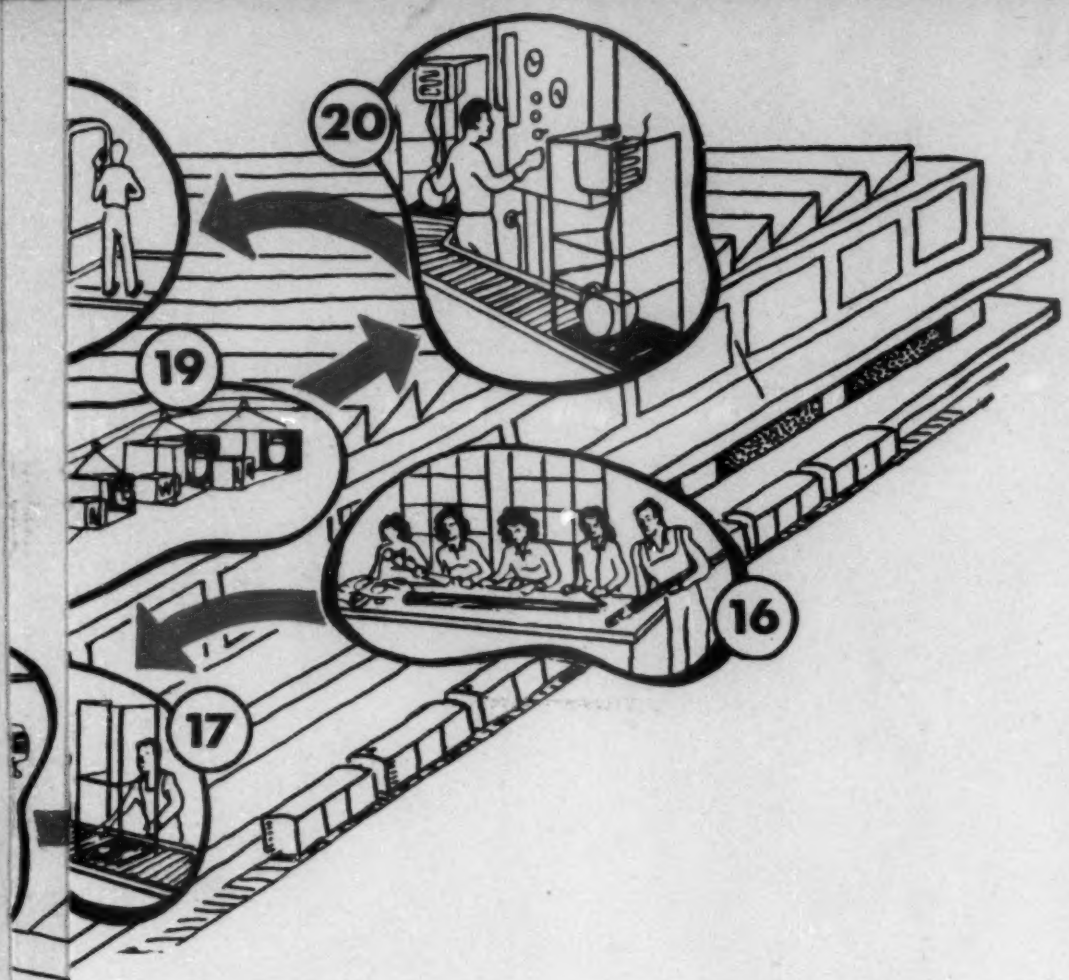
UNIT PRODUCTION

18. Unit assembly. Major subassemblies of compressor, condenser, and cooling unit are assembled and connected into a complete refrigeration unit. Silver soldering establishes tubing to connecting joints with a resistance to vibration many times greater than needed in the most extreme service.

19. Unit leak test. The assembled unit is pressure-tested for any possible leaks under water; then evacuated to practically absolute pressure to remove all non-condensible gases prior to charging.

20. Freon charging. The completed unit receives an accurately metered charge of (1) refrigerant Freon 12; and (2) specially processed refrigeration unit lubricating oil, through automatic charging boards.

The completed unit is operated for a final performance test period under controlled temperature and humidity conditions to insure uniform performance of all units. Following this test the unit goes to the refrigerator line for installation in the cabinet.



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METHODS-TIME MEASUREMENT

H. B. MAYNARD, PRESIDENT

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METHODS ENGINEERING COUNCIL, PITTSBURGH

JOHN L. SCHWAB, MANAGER

NEW ENGLAND DIVISION

METHODS ENGINEERING COUNCIL, BRIDGEPORT, CONN.

Methods-time measurement is an added tool of operation analysis in the kit of the methods engineer.

It gives answers in terms of time without the necessity of making stopwatch time studies. . . . The material included here is from the authors' forthcoming book. It covers only the utilization of methods-time measurement in the improvement of operations already being performed

FACTORY does not offer this material as a complete working tool. Its purpose rather is to acquaint plant operating men with a technique that will be discussed with increasing frequency, and will find broad application. It is therefore a technique with whose fundamentals they should be familiar

CTORY MANAGEMENT AND MAINTENANCE • Plant Operation Library No. 109 • February, 1948
pyright, 1948, by McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York 18, N. Y.

1 • DEFINITIONS AND USES

IN UNDERTAKING to engineer effective methods before beginning production, one is faced with the necessity for choosing among a large number of ways of performing every operation, and even every element of every operation. For example, in performing a simple sensitive drill press operation, the very first element will be "pick up part and move to spindle." In establishing the method for doing this, the methods engineer will have to decide such points as the following:

"Where should the material be placed in relation to the spindle?" "What type of container should be used?" "How should material be placed in the container to facilitate grasping?" "Should two-handed operation be employed?" "Should more than one part be grasped at one time?" "Where should the raw material be placed in relation to the finished material?"

The decisions on these and similar points determine the motions required to perform the operation. In order to be in a position to decide which set of motions is the best, it is necessary to know with certainty *how long* it will take to make the motions. The methods-time measurement procedure, which is based upon a predetermined methods-time standard, supplies the answers.

Definition

Methods-time measurement is a procedure which analyzes any manual operation or method into the basic motions required to perform it, and assigns to each motion a predetermined time standard which is determined by the nature of the motion and the conditions under which it is made.

Thus it may be seen that methods-time measurement is basically a tool of methods analysis that gives answers in terms of time without the necessity for making stopwatch time studies.

The procedure is called *methods-time measurement* rather than *motion-time measurement* because a consideration of *method* definitely enters into the application of the predetermined time standards that have been established. For example, it has been determined by investigation that the time required to make a simple *reach* motion of a given length varies with the nature of the object reached for. If the object is in a fixed location, the *reach* motion is made more quickly than if the object is one of several in a location that may vary from time to time.

The method employed in making the motion varies. In the first case, after habits of automaticity have been established by frequent repetition, the operator does not find it necessary to look at the object toward which he is reaching. He is so well oriented at his workplace that he does not need to look toward the object to locate it for his hand. In the second case, he must not only look toward the objects, but must also make a mental selection of the one that is to be grasped. Thus he employs a different method, and the time required is different.

Principal Uses

It requires a considerable period of experience with application before the full usefulness of any new procedure can be developed. At the present writing, the authors have been applying or supervising the application of the methods-time measurement procedure for about four years. This may be altogether too short a time to develop all the uses to which the procedure may profitably be put. Nevertheless, in that time the following utilizations have been made:

1. Developing effective methods in advance of beginning production.
2. Improving existing methods.
3. Establishing time standards.
4. Developing time formulas or standard data.
5. Estimating.
6. Guiding product design.
7. Developing effective tool designs.
8. Selecting effective production equipment.
9. Training supervisors to become highly methods conscious.
10. Settling grievances.
11. Research—particularly in connection with methods, learning time, and performance rating.

This article covers only the application of methods-time measurement to the improvement of existing methods.

2 • METHODS–TIME DATA

The seven tables on pages 99 and 100 present in summarized form the methods-time data that have thus far been checked and accepted as being satisfactory for application and use. By viewing the data in the few condensed tables that it has been possible to construct, an idea can be gained of the comparative simplicity of the methods-time measurement procedure.

Tables of time data have been compiled for the following motions:

1. Reach.
2. Move.
3. Turn (including Apply Pressure).
4. Grasp.
5. Position.
6. Disengage.
7. Release.

The tables have several blank spaces in which no time standards are shown. These spaces represent motion lengths or cases of positioning that have not yet been observed and analyzed in detail by the authors. Although in practical application no serious error will probably be caused by extending the curves or interpolating in the positioning table, it does not seem wise to publish standards obtained in this manner as being acceptable and accepted.

The seven tables cover all types of manual motions that have thus far been observed by the authors in their studies of a wide variety of industrial operations. They do not cover body and leg motions or eye time which occurs as a separate element in certain types of inspection work.

When the tables are applied with

METHODS-TIME DATA • TABLES I, II, III

I - REACH

CASE	DESCRIPTION	DISTANCE MOVED INCHES	LEVELED TIME TMU'S					
			A STANDARD	A – HAND IN MOTION	A – WITH CD OR B	B – HAND IN MOTION	C OR D	E
A	Reach to object in fixed location or to object in other hand or on which other hand rests	1			2.1		3.6	
		2			4.3		5.9	
		3			5.9		7.3	
		4	6.1	4.9	7.1	4.3	8.4	6.8
B	Reach to very small object or where accurate grasp is required	5	6.5	5.3	7.8	5.0	9.4	7.4
		6	7.0	5.7	8.6	5.7	10.1	8.0
		7	7.4	6.1	9.3	6.5	10.8	8.7
		8	7.9	6.5	10.1	7.2	11.5	9.3
C	Reach to object in group	9	8.3	6.9	10.8	7.9	12.2	9.9
		10	8.7	7.3	11.5	8.6	12.9	10.5
		12	9.6	8.1	12.9	10.1	14.2	11.8
		14	10.5	8.9	14.4	11.5	15.6	13.0
D	Reach to single object in location which may vary slightly from cycle to cycle	16	11.4	9.7	15.8	12.9	17.0	14.2
		18	12.3	10.5	17.2	14.4	18.4	15.5
		20	13.1	11.3	18.6		19.8	16.7
		22	14.0	12.1	20.1		21.2	18.0
E	Reach to indefinite location to get hand in position for body balance or next motion or out of way	24	14.9	12.9	21.5		22.5	19.2
		26	15.8	13.7	22.9		23.9	20.4
		28	16.7	14.5	24.4		26.3	21.7
		30	17.5	15.3	25.8		26.7	22.9

II - MOVE

CASE	DESCRIPTION	DISTANCE MOVED INCHES	LEVELED TIME TMU'S				MULTIPLYING FACTOR	
			A	B OR E	C	D-B – HAND IN MOTION	WEIGHT	FACTOR
A	Move object against stop	1	1.7	1.7	1.7		Up to 5	1.00
		2	3.6	4.2	4.2			
		3	4.9	5.7	5.7		10	1.03
		4	6.1	6.9	7.3	4.3		
B	Move object to approximate location	5	7.3	8.0	8.7	5.0	15	1.05
		6	8.1	8.9	9.7	5.7		
		7	8.9	9.7	10.8	6.5	20	1.08
		8	9.7	10.6	11.8	7.2		
C	Move object to exact location	9	10.5	11.5	12.7	7.9	25	1.11
		10	11.3	12.2	13.5	8.6		
		12	12.9	13.4	15.2	10.0	30	1.14
		14	14.4	14.6	16.9	11.4		
D	Toss object aside	16	16.0	15.8	18.7	12.8	35	1.16
		18	17.6	17.0	20.4	14.2		
		20	19.2	18.2	22.1	15.6	40	1.19
		22	20.8	19.4	23.8	17.0		
E	Move object to indefinite location	24	22.4	20.6	25.5	18.4	45	1.22
		26	24.0	21.8				
		28	25.5	23.1			50	1.25
		30	27.1	24.3				

III - TURN

DEG. TURNED	LEVELED TMU'S	DEG. TURNED	LEVELED TMU'S
30°	2.8	120°	6.8
45°	3.5	135°	7.4
60°	4.1	150°	8.1
75°	4.8	165°	8.7
90°	5.4	180°	9.4
105°	6.1		

Small – No load or parts up to 2 lbs. Use table value

Medium – Loads from 2.1 to 10 lbs. 1.57 x table value

Large – Loads from 10.1 to 35 lbs. 3 x table value

Apply pressure 16.2 TMU'S

Turn is a special case of Reach or Move. It is accomplished by a turning or torsional motion during which the hand and wrist turn. When Turn is combined with a normal Reach or Move, determine time for Turn and Reach or Move from the tables and use larger value

an understanding of the characteristics of the motions covered, it will be found that they make it possible to establish with remarkable accuracy the time required to perform the vast majority of industrial manual operations. But it should be emphasized that use of methods-time data without such an understanding will inevitably lead to failure. The authors therefore urge all methods men to "know" the seven basic motions before they try to use the data from the tables.

Unit of Time

The unit of time used in deriving the original data was $\frac{1}{16}$ second, the time that elapses between successive exposures when a motion picture is taken at a camera speed of 16 frames per second. In preparing the final tables, the desirability of using seconds, decimal minutes, or decimal hours was considered. It was decided that decimal hours would be a desirable unit to use because of the widespread practice of establishing production standards in terms of decimal hours. A

METHODS-TIME DATA • TABLES IV, V, VI, VII

IV - GRASP

CASE	DESCRIPTION	LEVELED TIME TMU's
1a	Pick-up Grasp — Small, medium, or large object by itself — easily grasped	1.7
1b	Very small object or tool handle lying close against flat surface	3.5
1c	Interference with Grasp on bottom and one side of object	8.7
2	Regrasp	5.6
3	Transfer Grasp	5.6
4	Object jumbled with other objects so that Search and Select occur	8.7
5	Contact, Sliding, or Hook Grasp	0

V - POSITION

CLASS OF FIT	EASY TO HANDLE			DIFFICULT TO HANDLE		
	SYMM.	SEMI-SYMM.	NON-SYMM.	SYMM.	SEMI-SYMM.	NON-SYMM.
1 Loose—No pressure required	5.6	6.6		9.0	13.7	16.3
2 Close—Light pressure required		14.1	21.9	19.6	25.5	27.2
3 Exact—Heavy pressure required	39.4	43.9	53.1			

SYMMETRICAL	SEMI-SYMMETRICAL	NON-SYMMETRICAL
Object can be positioned in an infinite number of ways about the axis which coincides with the direction of travel	Object can be positioned in several ways about the axis which coincides with the direction of travel	Object can be positioned in only one way about the axis which coincides with the direction of travel

Distance moved to engage — 1" or less

VI - DISENGAGE

CLASS OF FIT	EASY TO HANDLE	DIFFICULT TO HANDLE
1 Loose — Very slight effort — Blends with subsequent move	4.0	5.7
2 Close — Normal effort — Slight recoil	7.5	11.8
3 Tight — Considerable effort — Hand recoils markedly	22.9	34.7

VII - RELEASE

CASE	DESCRIPTION	
1	Normal Release performed by opening fingers as independent motion	1.7
2	Contact Release	0

major disadvantage was apparent, however, in that when the very small time intervals used in the methods-time measurement procedure are expressed in decimal hours it becomes necessary to resort to a large number of decimal places. The normal time for a simple *grasp*, for example, is $\frac{1}{10}$ second. This is the equivalent of 0.00001735 decimal hour, which is an awkward figure to use.

Time Measurement Unit

The difficulty was eventually overcome by arbitrarily choosing as the unit of measurement 0.00001 hour, which was given the name *time measurement unit*. This is readily abbreviated to TMU. When the time for a simple *grasp* is expressed in these units and the time is carried out to only one decimal place, the time becomes 1.7 TMU. This system gives simple, easily remembered numbers with which to work. They may readily be converted to decimal hours by multiplying by 0.00001. Thus if the time required to perform a given series of motions is found to be 325 TMU, the time in decimal hours is 325 x 0.00001, or 0.00325 hour.

Some engineers prefer to express their standards in terms of decimal minutes; a few prefer to use seconds. The conversion factors in these cases are 0.0006 minute and 0.036 second, respectively.

The tables are set up, therefore, in terms of leveled TMU. *They show the number of 0.00001 hours required by the operator of average skill working with average effort to make the motion under average conditions.*

1 TMU = 0.00001 hour
1 TMU = 0.0006 minute
1 TMU = 0.036 second

The tables do not include any allowances for fatigue, personal necessities, or unavoidable delays.

Recording Data

It has been found convenient to develop a code for referring to the various classes of motions. It would be awkward, for example, to have to refer to a "case *B* Reach, 10 inches long, with hand in motion" in so many words every time a motion of that sort was encountered. Therefore, for convenience, this is coded as *R10Bm*. Table VIII gives the coding for all types of motions.

3 · GETTING THE INFORMATION

There are two basic steps to be followed in applying the methods-time measurement procedure to operations that are already being performed:

1. Secure complete and detailed information concerning task, equipment, and method.

2. Analyze, classify, and record at the workplace every motion required to perform the job properly.

Neither step can be considered more important than the other. If the information is not recorded in detail, difficulty will be encountered in quickly and accurately classifying the motions during the observation period. In addition, if the occasion arises in which the study is to be used later in constructing a time formula, insufficient information will make it difficult if not impossible to interpret the study.

Information. Before application of the methods-time measurement procedure is made, complete information in regard to tools, workplace layout, processing information, operation and material identification, and working conditions should be recorded (see Figure 1).

Operation. The operation should be clearly identified by a short and descriptive name, using the terminology in common use in the plant. Although the identifying name should be concise, it should be complete enough to be descriptive. "Mill" conveys only a very general idea of the nature of the operation. "Mill slot" is considerably more meaningful. "Mill ½x¾-in. slot for stub shaft" is a positive identification of the operation to anyone who is familiar with the apparatus.

In plants that follow the practice of identifying operations by number as well as by name, the operation number also should be recorded.

Location. The description of the location should be complete enough to permit any interested person to determine exactly where the study was taken. The department name and number will fix the general location. Where machines that are permanently fastened to the floor are involved, the machine number will determine the exact location. In the case of work done on a bench or on the shop floor, exact location identification is more difficult. If the plant has the practice of numbering columns, the column numbers in conjunction with a sketch will serve to locate the workplace. If not, then the nearest piece of permanent equipment may be used.

Operator. In identifying the operator, it is usually sufficient to record clock number and name and whether the operator is a man or a woman. Because the previous experience of the operator often has an important bearing on the method used, it is sometimes desirable to ascertain and record the amount of experience previously had by the operator on the operation under study or on similar work.

Part. To identify the part, or parts, involved in the operation, identifying numbers and names, supplemented by sketches, should be used. Practically every plant uses numbers to identify its products. If the components are not numbered, the completed product usually is.

In recording the name of the part, care should be taken to use the same name as the one that appears on the drawing or other identifying operation.

Sketches usually prove to be the most satisfactory means of part identification. Even a rough freehand sketch will show at a glance the general appearance of the part.

Material. Material should be identified completely so that its characteristics are ascertainable later on. Here again, concise but complete descriptions are better than one-word identifications—"20-gage hot-rolled steel" is a better description than merely "steel." Complete material specifications can often be obtained from the bill of materials or other manufacturing information.

Equipment. The equipment used to perform the operation has a major influence on method. Therefore it should be clearly identified. Sketches as well as identifying names and numbers are useful if the equipment is at all out of the ordinary. Any auxiliary devices that are used in conjunction with the major piece of equipment, such as jib cranes, special material racks or trays, and the like, should also be described.

The condition of the equipment often has an important effect on the operation. Therefore the condition should be investigated, and any departure from normal noted.

Quality requirements. Although it is constantly stressed that the

TABLE VIII · CONVENTIONS FOR RECORDING MOTION CLASSIFICATIONS

TABLE	EXAMPLE	SIGNIFICANCE
I	*R8C*	Reach, 8 inches, case C
	R12Am	Reach, 12 inches, case A, hand in motion
	R14ACD	Reach, 14 inches, case A with Change Direction
II	*M6A*	Move, 6 inches, case A, object weighs less than 5 pounds
	M16B15#	Move, 16 inches, case B, object weighs 15 pounds
III	*T30°S*	Turn 30°, small part
	T90°L	Turn 90°, large part
	AP	Apply Pressure
IV	*G1a*	Grasp, case 1a
V	*P1NSD*	Position class 1 fit, non-symmetrical part, difficult to handle
VI	*D2E*	Disengage, class 2 fit, easy to handle
VII	*RL1*	Release, case 1

DWG NO. 207503 ITEM 3

PART DESCRIPTION Bracket for steering wheel control

MATERIAL 1/8" X 1 1/8" cold rolled steel SAE 1020

OPERATION Drill 2 1/4" holes

OPER. NO. 3

LOCATION Dept. E24 Bldg A

MAN OPERATOR

~~WOMAN~~ NAME R. Green NO. 521

EQUIPMENT Single spindle No. 1 Avey sensitive drill press Table model - Mach. No. 1067

SPECIAL TOOLS Drill jig No. T415

CONDITIONS normal

QUALITY REQUIREMENTS
Hole tolerance 250" ± 003
Hole must fit gage No. GA 146-3

ITEMS STUDIED APPROVED BY INSPECTOR
H. S. Shanskie

STUDIED BY W. D. Foggarty

APPROVED BY J. L. S.

SKETCHES (Equipment, Tools, Parts, Work Place Layout, Etc.)

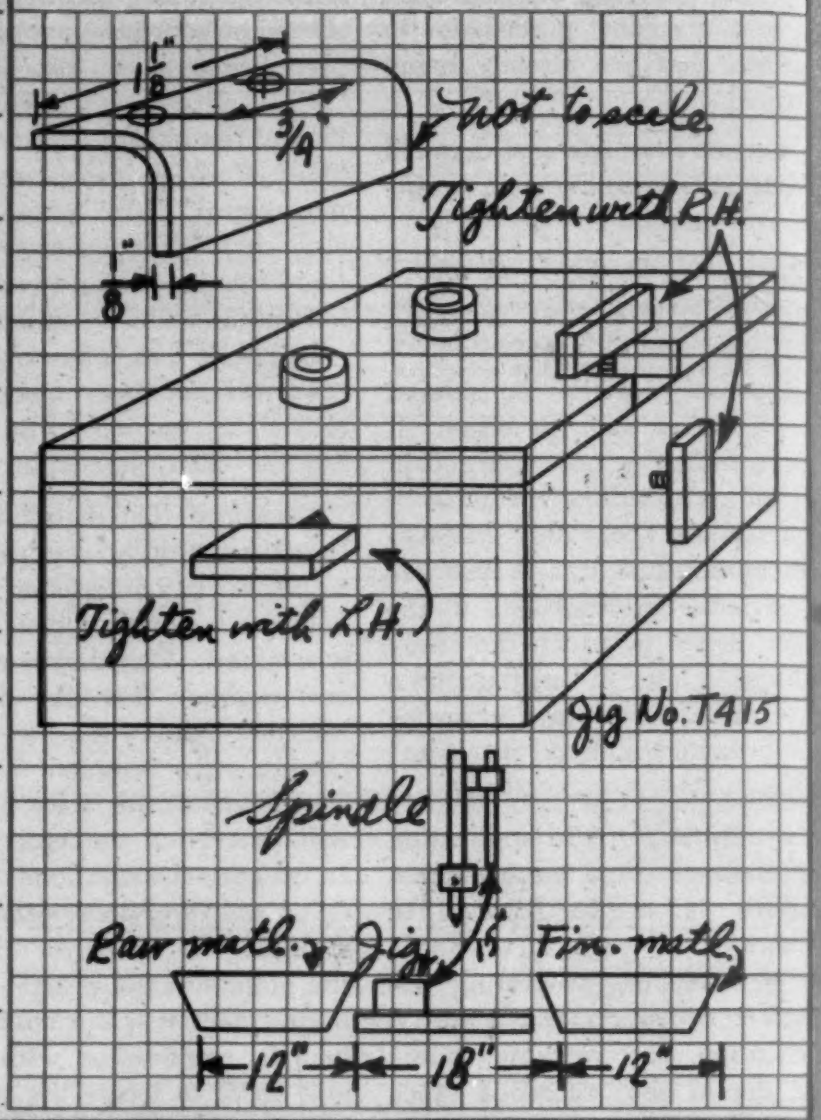

FIGURE 1. MODEL STUDY SHOWING MANNER IN WHICH INFORMATION ABOUT TOOLS, WORKPLACE LAYOUT, ETC., IS RECORDED

quality requirements of any operation should be thoroughly understood before the study is begun, this important point is overlooked sufficiently often to justify calling for a description of quality requirements on the observation sheet. In addition, because of the important influence of quality requirements on methods, it is desirable to have a record of the requirements that were in force when the study was made. Then, if the requirements are changed later on, it will be possible to determine whether a change in time allowance is justified.

It is usually best to ascertain quality requirements from the one who is directly responsible for judging the acceptability of the work. This is usually the inspector, but it may be the foreman, the engineer, or even, in the small plant, the owner. In describing the quality requirements on the observation sheet, the methods engineer should keep in mind that the ultimate purpose is to make it clear to anyone who may be interested in what the quality requirements were at the time the study was made.

Tool and part sketches. A complete and clear sketch of the parts to be processed and the design of any tools, dies, or holding means that affect the motions required to perform the job should be drawn in the cross-sectional area of the observation sheet. These sketches should indicate the conditions affecting positioning, and, when necessary, the hand that must perform the motions.

Workplace layouts. A sketch of the workplace layout must always be drawn before application of the methods-time measurement procedure. Because the location of the materials and tools and the construction of the parts and tools largely determine the motion pattern used, the sketch will crystallize in the observer's mind the general motion pattern that will be used.

The sketch should be drawn roughly to scale. The location of the parts should be identified by name or style number; tools and fixtures should be indicated; and any object that may hinder free movements of the hands should be included in the sketch. Other pertinent information that it may be desirable to include, such as the type of container, can be sketched rather than recorded in writing if desired.

Conditions. It is important that a record be made of the working

DATE 2-15-47
STUDY NO. 3
SHEET NO. 1
OF 1 SHEETS
OBSERVER W. L. Foggarty
DWG. 207504 Item 3
PART Bracket
OPERATION Drill 2 1/4" holes
SKILL C-1
EFFORT C-2
REMARKS Operator has had 6 months experience on this class of work

TIME ALLOWED PER PIECE .00774 hrs

	Get part with LH from tote pan, transfer to R.H and place in jig			Tighten 2 locators simultaneously, close jig cover with L.H, and tighten thumb screw with RH			Reach to spindle lever RH, lower spindle and position jig under drill			Drill 1/4" hole 1/8" deep		
	LH	T	RH	LH	T	RH	LH	T	RH	LH	T	RH
	R10c	12.9		R6B	8.6	R6B		11.0	R15A			
	G4	8.7		G1a	1.7	G1a		1.7	G1a			
	M15B	15.2		T90	5.4	T90		13.4	M12B			
		5.6	G3	RL1	1.7	RL1	P2SD	19.6				
	R8B	10.1	M6C	T90	5.4	T90		8.7	M6A			
	G1a	1.7		G1a	1.7	G1a		1.7	G1a			
		27.2	P2NSD	T90	5.4	T90						
	RL1	1.7	RL1	AP	16.2	AP						
				RL1	1.7	RL1						
				R6B	8.6							
				G1a	1.7							
				M10a	11.3							
					7.1	R4B						
					1.7	G1a						
					5.4	T90						
					1.7	RL1						
ELEMENT TIME TMU'S	83.1			85.3			56.1					
CONVERSION FACTOR	.00001											
LEVELED TIME hrs	.000831			.000853			.000561			.00125		
% ALLOWANCE	15%											
ELEMENT TIME ALLOWED	.00096			.00098			.00065			.00144		
OCCURRENCES PER CYCLE	1			1			1			2		
TOTAL TIME ALLOWED	.00096			.00098			.00065			.00288		

Speed = 70 R.P.M. = 1070 R.P.M.
Feed = .0025" per revolution
Lead of drill = .025"
Thickness of material = .125"
Drilling time $\frac{(.075+.125).0167}{.0025 \times 1070} = .00125$ hrs

FIGURE 2. MODEL STUDY WITH ALL COMPUTATIONS COMPLETED FOR FOUR ELEMENTS

conditions existing at the time of the study. If conditions are normal, this fact should be noted. Any abnormal conditions should be described. Unsatisfactory working conditions may lower the effectiveness of the operator and may make it difficult for him to attain the standard. Recording such conditions brings them to light and makes the necessity for correcting them more evident.

Dividing the operation into elements. In dividing the operation into elements, the general procedure used in making a time study should be followed. Constants and variables should be recorded separately for observation. Elements should be kept as short as possible to enable the observer to identify more clearly and quickly the motions used in performing them.

This latter point is important. To gain speed and accuracy in applying the methods-time measurement procedure, it is imperative that the observer be able mentally to reconstruct each element after it has been witnessed once or twice. If the element is of long duration and made up of a great many motions, the observer's mind may become confused when trying to recall all the motions and their order of occurrence. Thus the element will have to be observed many more times in order to record accurately the motions used. This is time consuming and may result in inaccuracies. If the elements are kept short, with the number of motions required for their performance not exceeding 20 per element, this difficulty will not be encountered.

The importance of clearly describing each element should be emphasized. The description should indicate the method by which the element was performed. The description should be written in such a manner that an engineer unfamiliar with the method described, but with an understanding of the methods-time measurement procedure, can, by reading the element description and the recorded motion sequence, accurately reconstruct the method followed in performing the operation.

A detailed sketch of the workplace layout and tools used makes it possible to shorten element descriptions. For example, distances recorded on the sketch may be omitted from the element description. When the sketch shows the location of parts and materials, the hand used in reaching for them is usually obvious to the trained methods engineer.

4 • RECORDING THE MOTIONS

The observer should begin by watching carefully one or two cycles of the operation. During this time, if he is familiar with the methods-time measurement procedure, he can obtain a fairly complete mental picture of the motions required to perform the entire operation. The study of the workplace, tools, and set-up made before the observations began, will assist in obtaining this preliminary mental picture.

Each regular element of the operation should then be studied in order of occurrence, and the motions required to perform it should be recorded. One or two observations of the element may be necessary to determine with exactness the way it is performed, especially if the motions required are complex in nature. Each motion should be recorded in either the column headed *Left Hand* or *Right Hand* under the element column in the order of its occurrence. The motions used are indicated by the conventions for describing motions in

abbreviated form (see Table VIII). Figure 2 shows the model study with the observations completed for three of its seven elements.

Limiting Motions

The limiting motions only should be recorded. The element descriptions, if properly written, should preclude any possibility of a later misinterpretation of the method used, even though the motions which are not limiting are not recorded on the observation sheet. If for any reason it is desired to record the non-limiting motions, they may be recorded in the same manner as the limiting motions, but the descriptions should be circled to indicate they have no bearing on time allowed. On line 5, column 1, Figure 2, the motion *M6C* is circled to show that it is not limiting.

Foot, leg, and body motions should be recorded in the columns headed *Right Hand* in all instances. If the hands and arms are performing non-limiting motions simultaneously with the motion of the leg, the motions may be recorded if desired on the line immediately above the line on which the leg motion is recorded.

Although it is desirable, if possible, to study elements in the order of their occurrence, it is not always practicable. On long jobs, considerable time could be spent by the engineer in waiting for a certain element to occur in the work cycle.

Elements that are necessary but which are not repeated on every cycle should be observed and recorded on the observation sheet in the same manner as the repetitive elements. A notation should be made on the next to the last line of the observation sheet of the number of times they occur per cycle, and whether the necessity for performing them is temporary or permanent. If they are a permanent part of the operation, such as gaging every fifth part, replenishing supply of material in bins, etc., they must be included as a part of the final time value.

Foreign Elements

Foreign elements are those elements that are not necessary for the performance of the operation. They include such items as dropping a part, personal delays, minor machine troubles, etc.

The time for unavoidable foreign elements is not included in the final time value as a distinct elemental time, but is covered by the allowance for fatigue and unavoidable and personal delays, which is added to the leveled time.

The skill and effort exhibited by the operator during the study should be recorded before leaving the job. This may be of assistance in judging the effectiveness of the methods.

5 • MAKING THE COMPUTATIONS

The column for each element headed *Time* will appear blank on the observation sheet at this point. In the columns headed *Left Hand* and *Right Hand* will appear the descriptions of the motions used in performing the element. The first step in working up the study is to determine from the methods-time data tables the leveled time in TMU for each motion and to record it in the *Time* column. Descriptions that are circled should be disregarded and only the time values for the limiting motions recorded. The time values should be recorded in ink to insure permanency and to distinguish them from the penciled descriptions.

When all time values for each element have been determined and recorded in the *Time* column, they should be added and the sum recorded on the line headed *Element Time, TMU's.* This sum is the time in TMU required to perform the element when a normal performance is given, exclusive of allowances for delays and fatigue. This value must then be converted into hours, minutes, or seconds to coincide with the procedure used in the plant. The proper factor should be recorded on the line headed *Conversion Factor.* The product of this factor and the element time in TMU is then determined and recorded on the line headed *Leveled Time.* It is usually wise to indicate the units in which the leveled time is expressed —namely, hours, minutes, or seconds—to avoid any possibility of future confusion.

Allowances

During the course of the working day, there are a number of occurrences that prevent the operator from working continuously. Many minor delays occur that are unavoidable no matter how much the operator tries to escape them. He must stop work from time to time to receive instructions from the foreman, to answer legitimate questions asked him by staff people, to make minor repairs to tools and equipment, to pick up dropped materials, and for a number of other reasons, all of them justified. Such interruptions are known as "unavoidable delays."

In addition, the operator will find it necessary to stop work from time to time for personal reasons such as getting a drink of water, making a trip to the lavatory, etc. Finally, as the working day progresses, the operator will experience in increasing amount the retarding effects of fatigue.

Allowances must be made for these retarding factors if the operator who works at the average performance level is to be able to meet the time allowed for doing the work throughout the full day.

Occurrences per Piece

In the next to the last line at the bottom of the observation sheet, the number of times each element occurs for each piece is recorded. If every fifth piece produced is gaged, the allowed element time divided by five would determine the amount of time that should be allotted to each part. Similarly, if chips are brushed from a drill-press table every tenth piece, the allowed elemental time for brushing chips divided by 10 would be the time allowed per piece for brushing chips.

When the number of occurrences per piece has been recorded, the total time allowed for each element should be determined and recorded on the last line of the observation sheet. The total times allowed for each element are then added to determine the time allowed per piece.

HOW TO STOP FIRES IN INDUCTION HEATING EQUIPMENT

Typical fires. Lessons they teach. Suggestions that reduce hazards in devices using radio-frequency energy

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A NEW source of industrial fires needs to be included in every plant survey of fire hazards. Dangerous fires can be caused by induction and dielectric heating equipment. No unit is too small to be overlooked for such a possibility.

Induction and dielectric heating equipment is being used more and more. Industry employs it in the melting, heat-treating, brazing, and soldering of metals, and in the heating of non-conducting materials such as plastics, paper, rubber, wood, textiles, and food. The energy used for both induction and dielectric heating is radio-frequency energy, the same as that used in radio broadcasting. Many of the induction and dielectric heating sets are practically identical with radio broadcasting sets, with their electronic oscillator and rectifier tubes, capacitors, inductances, etc., enclosed in metal cabinets. Others employ spark-gap type oscillators instead of electronic tubes. Some are enclosed in wooden cabinets.

This new method of generating and applying radio-frequency energy has revolutionized some manufacturing processes, speeding up the work, reducing the required floor space, reducing spoilage, and cutting manufacturing costs. In these cases the radio frequency generators become a valuable and important part of the manufacturing equipment.

Unfortunately the conditions in

many factories where these units are installed for the production of heat are far different from those in a radio broadcasting station. The factory atmosphere may contain dust, lint, and oily vapors which will cause unsatisfactory conditions unless proper steps are taken to prevent or correct them.

An oily deposit of dirt, dust, or lint on the inside of the cabinet and on the various parts of the equipment increases the fire hazard of equipment that might otherwise be considered as fire-safe as a switchboard or motor controller. The use of a combustible cabinet to enclose the induction or dielectric heating equipment also seriously increases the fire hazard and often results in the destruction of the equipment when fire starts inside the cabinet.

One recent fire involved a high-frequency induction-type hardening unit in a plant in Schenectady, N. Y. It was a spark-gap type having a wood frame and pressed wood enclosure. Arcing at a selector switch ignited combustible insulation and the wood frame. The destruction of the induction heater was practically complete, and the loss from direct damage and interruption to production was estimated at $6000.

Another fire occurred in 1946 in a high-frequency hardening machine in a factory in Hoopeston, Ill. This also was a spark-gap type machine with wood frame and pressed wood panels. Fire in the insulation was started by an electrical breakdown caused by deposits of conducting material. The property loss and loss of production amounted to about $1400.

Two fires occurred in 1944 in a high-frequency hardening machine in a factory in New Britain, Conn. This was a spark-gap type machine having wood frame and pressed asbestos panels. One fire was caused by a breakdown of insulation at the transformer terminals, and the other by excessive current igniting insulation on connecting wires. These fires were extinguished promptly with total damage of about $600.

In 1943 a fire occurred in an induction brazing unit located in a factory in Cicero, Ill. This was a spark-gap type unit with wood frame and pressed wood enclosure. The fire was caused by an electric spark which ignited an oily deposit of lint and dirt on the electrical equipment inside the enclosure. The machine was badly damaged and had to be entirely rebuilt. The cost of repairs and lost production amounted to about $8000.

In 1941 a fire occurred in a case-hardening induction heater in a factory in Bridgeport, Conn. It was a spark-gap type with steel enclosure. An electrical breakdown, probably caused by leakage from one of the water cooling pipes, ignited the insulation on the electrical connections. The device was badly damaged and repairs cost approximately $7000.

LESSONS LEARNED

The main lessons to be learned from these fires are:

1. Combustible frames, enclosures, and insulation are undesirable features of radio-frequency induction or dielectric heaters.

2. Machines should be kept clean because internal deposits of dust, dirt, or lint may cause an electrical breakdown and fire, and may also add materially to the combustible material involved in the fire.

In a recently completed investigation to develop standards of adequate fire safety for these units, we received helpful cooperation both from manufacturers of the equipment and from a number of users. The following suggestions, part of which relate to construction details and part to installation and use, are offered for the reduction of the fire hazard.

CONSTRUCTION SUGGESTIONS

1. The frame and enclosure should be non-combustible and sufficiently strong to prevent mechanical injury.

2. Combustible insulation should be reduced to a minimum. Transformers should be the dry or non-flammable type. Dry-type transformers should have Class B insulation (inorganic material such as mica, asbestos, fiber glass, etc.). Electrical connections, if insulated, need a flame retarding covering.

3. Proper overcurrent protection is necessary to prevent overheating of any part of the equipment.

4. When water cooling is used for the electronic tubes, spark gaps, or high-frequency conductors, the cooling coils and connections should be so arranged that leakage or condensation will not damage the electrical equipment. The cooling water supply should be interlocked with the power supply.

5. When forced ventilation by means of motor-driven fans is necessary, the air supply should be interlocked with the power supply and a fiber glass air filter should be provided at the air intake.

6. Dielectric heaters of the conveyor type used to heat combustible materials should have the conveyor motor and the power supply interlocked to prevent overheating of the material being treated.

7. Dielectric heaters used for treating highly combustible materials should be designed to prevent a disruptive discharge between the electrodes.

INSTALLATION SUGGESTIONS

8. As far as possible, high-frequency induction heaters and dielectric heaters should be installed in clean areas, not be exposed to dust, lint, or oily vapors.

9. All types of radio-frequency heaters should be inspected periodically, and kept clean.

10. High-frequency induction heaters should be so located that they will not be damaged by quenching liquids used in the heat-treatment of metals.

11. In case of fire in a high-frequency induction or dielectric heater, care should be taken not to use fire extinguishing agents that will conduct electricity or cause any additional damage to the equipment.

CENTURY EXECUTIVES TRAINING FORUM

SUBJECT: SUPERVISION AND THE BUDGET

I. LIVING WITHIN YOUR INCOME

A. Your personal budget

1. Food, groceries, meats, milk, etc.
2. Shelter costs, rent or depreciation, interest, insurance, maintenance and service charges (telephone, gas, light, etc.)
3. Clothing—includes new clothing and upkeep
4. Education—includes tuition, magazines, and all expenses incidental to your education
5. Recreation, charity, medical expenses, and taxes
6. Savings

B. Industry budgets must provide for

1. Materials and supplies
2. Salaries and wages
3. Rent, depreciation, interests, insurances, taxes, and many other manufacturing cost items
4. Tools and machinery
5. Dividends and expansion

II. SETTING UP THE BUDGET PATTERN

A. Analysis by sales organization of prospective volumes, by kinds, types, and sizes of motors

B. Preparing production schedule to tie in with budgeted sales volumes

C. Anticipating cost of production

1. Material
2. Direct labor
3. Expenses—indirect salaries and wage bonuses, shop loss, guarantees, spoilage and scrap, depreciation, insurance, taxes, and many others
4. Administration and selling costs
5. Profit

III. MEETING THE BUDGET BOGEYS

A. Productive bogeys

1. Experienced operators
2. Standardization of operators

B. Non-productive bogeys

1. Careful planning, controlling is necessary on non-productive labor, as it is not as thoroughly standardized nor are routines developed as is the case with productive labor
2. Non-productive operations should be studied by standards for each department

C. What a supervisor can do about the budget

1. Everlastingly compare actual results with budgeted costs or bogeys.
2. Study all operations, productive and non-productive, with the idea of further cost savings
3. Encourage assistants to be constantly looking for new ways of performing an operation, productive or non-productive

IV. DISCUSSION PERIOD

TYPICAL FORUM PROGRAM. DISCUSSION OF SUBJECTS LIKE THIS HELPS SUPERVISORS KNOW WHAT'S GOING ON, WORK TOGETHER

EXECUTIVE TRAINING FORUM PAYS OFF IN GREATER TEAMWORK

WILLIAM KEISER • CHAIRMAN, EXECUTIVE TRAINING FORUM
CENTURY ELECTRIC COMPANY, ST. LOUIS

No secrets at Century Electric. Everyone understands the other fellow's problem. All troubles are thrashed out in its Executive Training Forum.

Stated objectives of the forum are: (1) Study together with a common aim for self-improvement; (2) provide a common ground on which to build mutual understanding; (3) attempt to understand common business problems; (4) promote the good-will of the company; (5) work for general improvement in company operations.

Membership is voluntary. It represents management functions in all departments. The group meets one evening a month. Alternate meetings include a dinner at a hotel or the YMCA. Meetings start promptly, and seldom last longer than an hour and a half. Almost one-third of the 125 members serve on committees. Membership on the program, liaison, publicity, membership, arrangements, and advisory committees ranges from four to eight persons.

Reports are made to the board after regular committee meetings. Because service on committees offers much in education value, supervisors are always eager to be selected. Committee meetings are held during business hours, on company premises.

What the Communists Have

WARNING TO AMERICAN INDUSTRY: *At the moment, the Communists seem to be losing out in French industry. Many unions have withdrawn from the CGT (General Confederation of Labor) and have joined the anti-Communist "Force Ouvrière." But the Reds say this is only the first round in the fight and that they will recover lost ground. Whether they do or not, French industry has suffered severely from Communist influence. Can the same thing happen in the United States? Not if industrial management and organized labor are properly on guard. Not if they learn in time the lesson that the French experience teaches*

HERE ARE THE MEN WHO HEAD FRENCH REDS

● FRENCH labor's traditional May Day parade in 1947 brought out five chiefs of the Communist Party to lead the marchers. Left to right, they are Marcel Cachin, Andre Marty, Maurice Thorez, Jacques Duclos, and Leon Mauvais.

Thorez is perennial secretary-general and top man in the Party. Called up for military service in 1939, he went underground instead, managed to get to Russia, reportedly spent most of the war sitting in Moscow with his comrades of the Comintern—the same comrades who have fanned out over Europe to take over leadership in their native Communist Parties. He's 47, a handsome man with the blue eyes of the northern Frenchman. His speechmaking is of the Uncle Joe variety—able, thorough, lengthy, monotonous, and un-French. He also has a temper. At a recent election rally he gave a Socialist candidate who attacked his war record two hefty blows in the face, then turned him over to the goon squad for further treatment.

Duclos is number two man, the Party's parliamentary leader and reputedly its sharpest brain. He's 51, has the quick wit, the sly smile, and the malicious twinkle of a man from the South. It was an article by Duclos in 1945 that caused American Commies to kick out Earl Browder.

Cachin (aged 78) was a principal founder of the Party in 1920, is director of *L'Humanité*, its biggest newspaper. **Marty** led a mutiny of the French fleet in 1919, headed the French International Brigade in Spain, is now chief of the super-revolutionary wing of the Party. **Leon Mauvais** is organizational secretary.

Done to French Industry

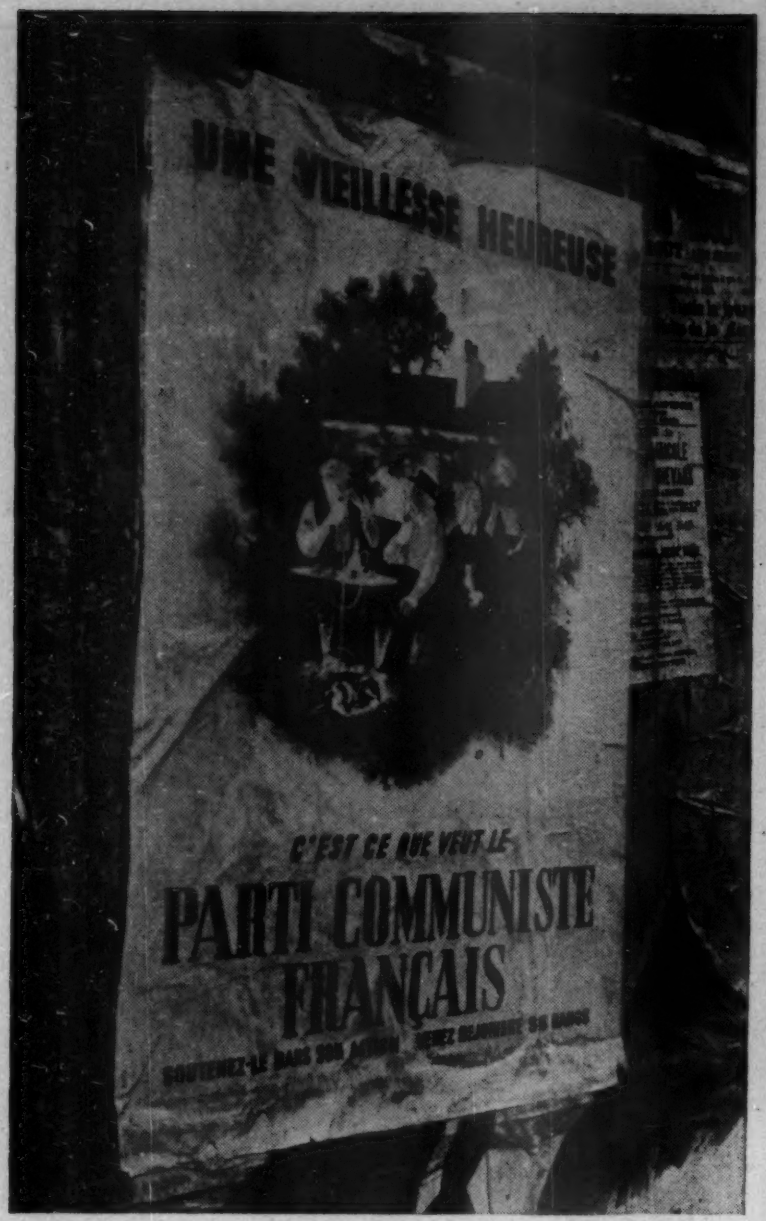
MICHAEL MARSH • PARIS BUREAU, McGRAW-HILL WORLD NEWS,

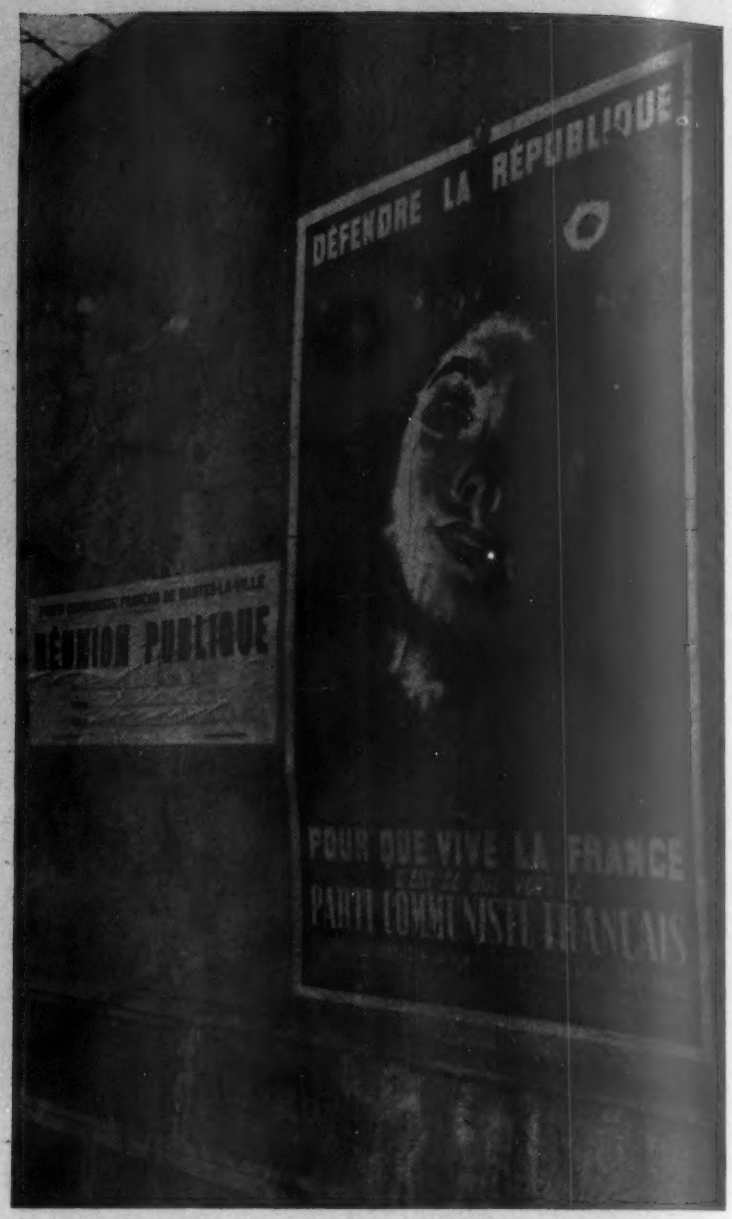
PLAYING on widespread desire for reform, Communists in the French national government have helped push through many social changes since the war. The coal mines, gas and electric companies, chief banks, and insurance companies have been nationalized. A cradle-to-grave social security system has been installed. Extreme reforms benefiting practically all working classes have been made law.

"Enterprise committees," made up of workers' delegates and the employer, have been set up in each firm with more than 50 employees. They run factory canteens and social services, have the right to hire an accountant to go over the books, but are supposed to keep professional secrets. They "must be consulted on questions pertaining to the organization, direction, and general running of the enterprise; must be informed of profits made by the enterprise; and can suggest how profits shall be distributed."

The Communists are not entirely happy with these committees. They have gained considerable momentum, and the Party reportedly would like to use them to force emloyers to the wall by pressing impossible demands. Through them, however, some workers have come to understand that some of their demands are impossible. Communists now, say other unionists, are less interested in the committees than they are in taking over industries at the national level.

How much farther the Communists can go—or will





POSTERS everywhere in France back up the powerful Communist press. They promise the complete works, including (left) a happy old age. Poster at right protests that what the Party wants is to defend the Republic so that France may live

go—in industry at either the local or national level, is an open question.

They are now following a new line, laid down in October with the creation of the Cominform. They have swung from boosting production and denouncing strikes to violently opposing the government and setting off strikes—sometimes without even bothering to consult the workers involved. Their attempt at a nation-wide series of strikes in November apparently resulted only in defeat for the Party. Meanwhile they are laying down a tremendous barrage of propaganda against America and the Marshall Plan.

Both the strikes and the opposition to the Plan, which is understandably popular with workers, have cost them ground. Quite possibly the Party is once more on the skids, especially since more than a million workers have broken away from the CGT (General Confederation of Labor).

If the Party is on the skids, it is because Frenchmen dislike the abrupt twists of the Moscow line and because people who can sit down to a good dinner every night dislike extremists.

But the Communists can bounce back. They have done it more than once. In doing it, they almost put France under their thumbs—and they furnished a lesson for Americans.

In doing it, they exploited weakness and revealed tactics that Americans, in management and in labor, must recognize and must guard against.

How did the Communists in France build up enough power among workers so that they practically took over industry—and the country—as they did in 1947?

The answer is that French management, before and during the war, made mistakes that paved the way for the Party. By opposing labor's advances, management and the government opened a road ready-made for Communist exploitation.

Surprisingly, it took the Communists only five years to spring from an outlawed, underground few in disrepute with the French people to the leadership of millions—with complete control of France almost in their hands.

In 1933 the Party had only 29,000 members. Its trade union affiliates, in 1935, claimed only 230,000 members. After a right-about-face in the Communist International line in 1936, the Party linked up with the Popular Front and the trade unions joined the independent CGT.

The Party gained and held influence for a few years, although it was largely the Socialists who forced French employers to recognize unions, grant higher wages and the 40-hour week, sign industry-wide bar-

gaining contracts, and install shop stewards. Workers began to drift away from the CGT, however. A Communist-inspired general strike failed in 1938, and the drift became a rout.

Then came the Hitler-Stalin pact and the declaration of war in 1939. The Communist Party was outlawed. Many Communist government leaders were arrested, tried, and sentenced to jail. The CGT booted out Communist leaders. The underground Party probably lost much of its membership. The Commies were down and out.

But the government, urged on by employers, wiped out nearly all of the gains workers had made in the previous years and began a system of paying less than normal rates for overtime. The Communists went all-out with anti-war propaganda and made some headway. They urged workers to delay armament production and render its output useless. Their slogan was: "An hour lost for production is an hour gained for the revolution."

Even after France was invaded, they opposed taking sides in the war.

The Reds' Noble Role

But on June 22, 1941—when Russia was invaded—French Communist neutrality changed overnight. From then on, Communists led the Resistance. In numbers and in energy, in the "maquis" and in the factories, against the Nazis and against the Vichy government, the Commies led the fight. From that day their popularity began its upswing.

They were helped by two events. Petain banished the CGT, but it was reconstituted underground and the Communists were accepted back in it. And they made their peace with de Gaulle, collaborating with the de Gaullists inside France and joining the Free French groups outside.

Their influence rose phenomenally because of their noble role in leading the Resistance. They took the lead in fomenting strikes under the occupation. They led the guerilla activity—activity which included sabotage of no less than 2000 trains in 1943.

When the Liberation came, the Communists were picking up influence and adding thousands of members. By the middle of 1945, they had 900,000. In the municipal elections that year they polled 5,000,000 votes. In the mushrooming CGT, they grabbed leadership of many unions, although their present top control was only established at the top levels in April, 1946.

Since then they have polled 25 to 30 per cent of the French vote—and this in a country that remains half rural and where there are half as many employers and independent artisans as there are workers. They had a majority of more than 80 per cent in the last general convention of the CGT, which had 6,400,000 members early in 1947. Since there are only 2,500,000 factory workers in all France, control of the CGT gave the Communists domination over not only industry, but also the mines, transport, farm labor, government employees, and much of the white collar class. They have important, if not dominating influence in the new grouping of farm organizations created at the Liberation. They dominate the farm laborers' union, a number of farm cooperatives, and hundreds of thousands of tenant farmers. Their Front organizations appeal to the young and old, women, tenants, war veterans, writers, Resistance members, retailers—whatever you are, there is a Front organization for you.

GENERAL CONFEDERATION OF LABOR
(CGT)
1947 MEMBERSHIP

Metalworkers' union	1,030,000
Construction and woodworkers' union	800,000
Railwaymen's union	425,000
Farm laborers' union	400,000
Textile workers' union	350,000
Miners' union	338,000
Foodworkers' union	325,000
Clerical workers' union	250,000*
Chemical workers' union	210,000
Communications workers' union	163,000
Plus 23 other national unions with smaller membership	2,116,000
Total	**6,407,000**

**Non-Communist control*

BREAKDOWN of CGT unions shows Communists, prior to December 18 setback, controlled all but the clerical workers

What was behind this sudden rise, the upsurge that carried the Communists from an outlawed minority to whip-cracking leaders?

First, there is the party organization—"democratic centralism." It has two principles:

1. Each level in the stratified pyramid elects the next higher level.

2. "Decisions taken after discussion must be applied by everyone, the minority submitting itself to the majority."

As it works out, this "democratic centralism" means that no ordinary party member ever gets a chance to vote for or against the men at the top. His cell, in his factory, office, or neighborhood, elects a delegate to the section. Sections elect delegates to the federation, which covers all sections in a *department,* one of France's 89 political districts. The federation, in turn, names delegates to the national congress. The congress elects a 38-man central committee. The committee names a 13-man Political Bureau, and it fixes the top organization. The machine practically cannot be

turned out from below. Yet every unit and every member in the whole structure has to follow the policy set at the top.

The French CGT unions use a similar system in their elections. It is a set-up for the "disciplined minority" tactics of the Communist leaders.

Second powerful weapon of the Party is its propaganda machine. Its two Paris daily newspapers print three-quarters of a million copies, its nine provincial dailies almost a half-million. A general weekly paper prints 140,000 copies, a union weekly 430,000, a weekly farm paper 300,000. There are no less than 73 provincial weeklies with a total circulation of 756,000.

Formidable, sensation-edited, biased, and inaccurate, the Communist press is the only reading for hundreds of thousands of French workers. It gives a political twist even to sex murders and sports. It slants news one way for one audience and the opposite way for another. For instance, the general Communist press will denounce the rising cost of living while Communist farm papers crow over higher prices for butter.

Posters, handbills, and colored comic strips back up the press. Indoctrination schools, Party courses, and union schools train new members and new leaders. In the past two years, for example, 251 advanced courses lasting from two weeks to four months have been given to nearly 5000 new local leaders.

All this is used to drill the Party line into members. In Goebbels fashion, it twists popular appeals and distorts every group's interests to match the word from Moscow.

The Communist machine and machinery went into high gear after the Liberation. It was the only organized, unified group in most of France—and it was ready to pick up the pieces everywhere.

Unions a Set-up for the Commies

In labor, Communists had a field day. Many former union leaders had gone into the Fascist-type set-up sponsored by Petain. In the mine union, for example, several important pre-war leaders had turned collaborationist. The Communists tarred them with that label, continued to swing the tar brush down to the local level—and won almost complete control.

In union meetings, they swung show-of-hand votes in which the timid would go along. They called meetings when their supporters could attend while the opposition was not free to come. They distributed ready-made slates of candidates at regional or national meetings where most of the delegates did not know one another. The slates would be salted with a few well-known non-Communists. All the Communists had to do was to move that the list be elected as it stood.

Their "disciplined unit" tactics, in a movement growing so fast that important locals shot from hundreds of members to thousands overnight, and their ready-made program, in a disrupted organization, carried the CGT for the Communists. Of the major French unions, only one was not Communist dominated in mid-1947.

Industry fell before the same onslaught.

French management, at the Liberation, was disorganized, practically in a state of petrified fear. French trade associations had been dissolved by Petain. Many leading French industrialists had accepted appointments to Petain's "Organization Committees" in each industry. Almost all had taken German orders to keep their plants going. Many of the most important firms had been tied in to their German opposite numbers by agreement or stock transfer. Many had been forced into sending some of their workers to forced labor in Germany.

Reds Took Over Many Plants

Management was wide open to Communist attack. The country was verging on anarchy. Communications and transport were disrupted. Armed Communist bands were the only law in many sections. Any worker could denounce his boss as a collaborationist. Purge committees locked up all the accused for months while they awaited trial. Communists denounced opposition leaders, collaborationists or not, and put them away while Party members moved in, taking over city and town governments as well as industrial concerns.

The Communists seized many firms outright. A high Communist official of the metal workers' union says that, among metal working concerns alone, more than 1000 were seized from collaborationist owners. Some were taken over by workers who installed their own management, under Communist leadership.

More basically, however, Communists capitalized on management's past faults. Much of French management had opposed collective bargaining as a "limitation of freedom," had blacklisted workers, and generally had been socially backward. French machine tools, on the average, were 25 years old. The Communists charged, with a large measure of truth, that French employers as a whole practiced "economic Malthusianism"—allowing the population to increase faster than industrial output increased. Even today many employers do not see that new machinery and new methods mean better living standards for workers. They have, however, accepted the principle of social reforms.

Because there was practically no chance for a worker or technician to rise to a top position, the average French worker has for many years believed in the class struggle—a set-up for the Communists.

Add to these reasons the stark misery of French workers in the year after the Liberation—and you have the springboard from which the Communists took off.

LESSON FOR AMERICAN INDUSTRY:
French Communists practically wrecked France's industry by capitalizing on labor's weakness and management's past faults. But in doing so they revealed tactics that Americans, both in labor and in management, can learn to recognize and guard against

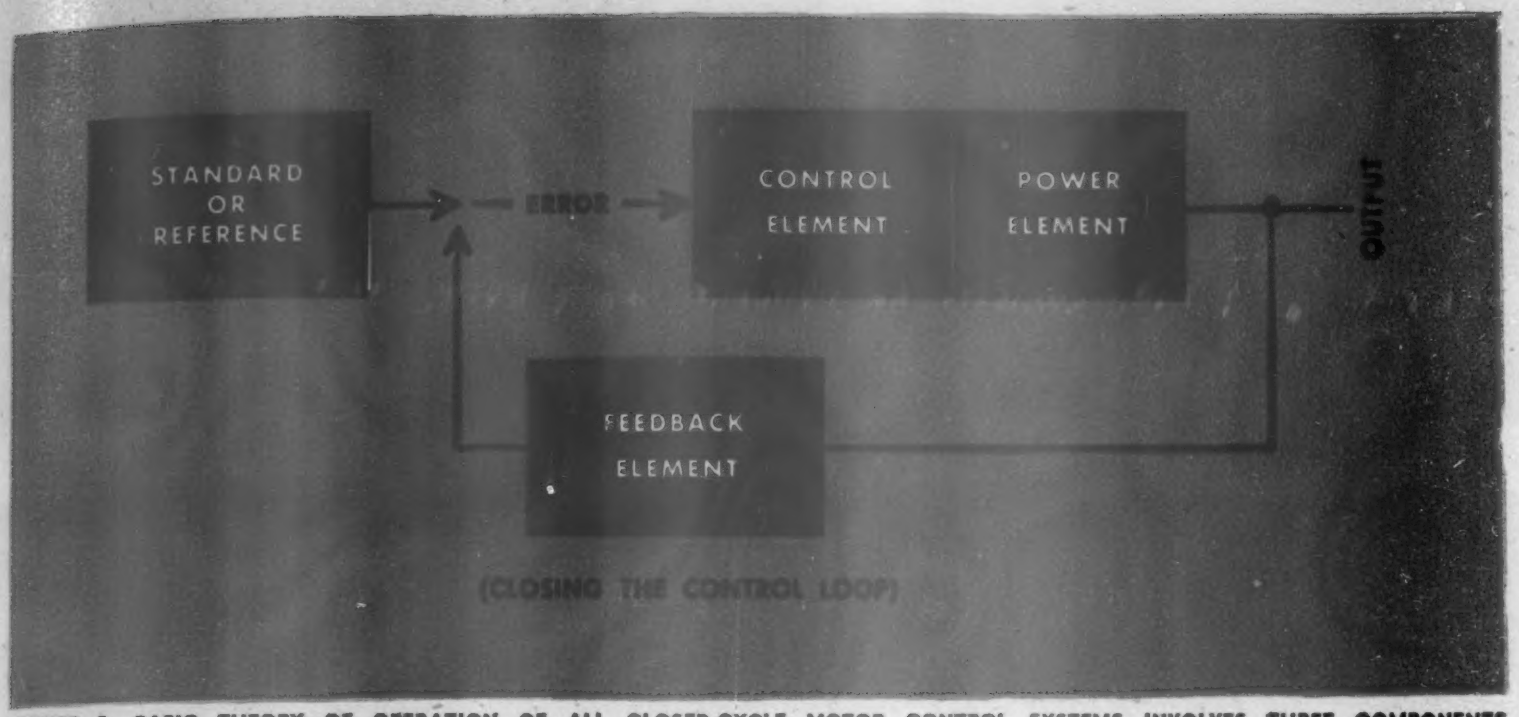


FIGURE 1. BASIC THEORY OF OPERATION OF ALL CLOSED-CYCLE MOTOR CONTROL SYSTEMS INVOLVES THREE COMPONENTS

CLOSED-CYCLE MOTOR CONTROL: WHAT IT IS

First of three articles describing closed-cycle motor control systems, their applications, and limitations

B. COOPER • CONTROL ENGINEERING DIVISION, GENERAL ELECTRIC COMPANY SCHENECTADY

CLOSED-CYCLE motor control is a form of automatic control that constantly thinks for itself, so to speak, and checks its performance against some recognized standard, minimizing or completely eliminating faults caused by human error. It is a step toward obtaining more uniform and desirable products and higher productivity per man.

This system of motor control is ideally suited to centralized control of manufacturing or processing operations. It is a tool that provides precise control of speed, torque, tension, acceleration, deceleration, load, current, voltage, temperature, position, or nearly any encountered quantity. Through the use of various amplifying means, closed-cycle motor control can be made to perform many useful everyday functions as well as special functions, using only infinitesimal signals or low power sources.

Various names have been used to describe this type of system, such as servo-mechanism, regulator, and follow-up. All these systems are similar in nature and may be schematically illustrated as in Figure 1.

In any closed-cycle system, a suitable reference must be selected. It becomes the established standard or measure of the desired performance. Actual performance is then always compared with this standard. As indicated by the lower square in Figure 1, part of the output is fed back and compared with the reference. This feedback provides the means of closing the control loop. The error or difference between the standard and feedback from the output is used as the controlling signal for initiating the control element. By constantly feeding back part of the output and checking it against the reference standard, variations from the desired output caused by changes in load, power supply, motor heating, and any other variables can be minimized.

Reference Standards

The first problem in establishing a closed-cycle motor control system is making the choice of a proper reference or standard for the control system. For electrical control systems, this reference usually is a voltage, current, or frequency reference, the voltage reference being, thus far, the most commonly used standard.

When a voltage reference is selected, it is usually quite desirable to eliminate as many spurious effects as possible. To eliminate fluctuations of the standard caused by power supply voltage variations, one of the two methods shown in Figure 2 is commonly used. Figure 2*A* shows a regulated reference supply commonly used in industrial applications, consisting of a control rectifier and a voltage regulator (VR) tube.

The reference voltage is taken from across the tube and may be adjusted by means of the potenti-

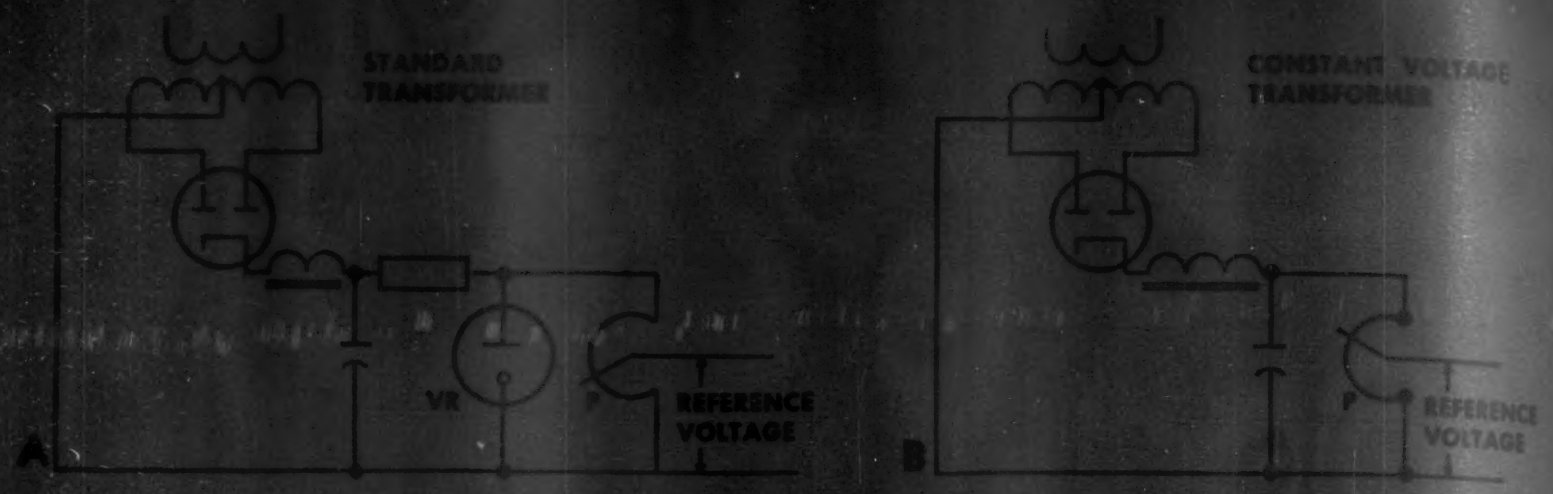


FIGURE 2. TWO METHODS OF GETTING A STEADY REFERENCE VOLTAGE WHERE VOLTAGE VARIATION EXIST IN POWER LINE

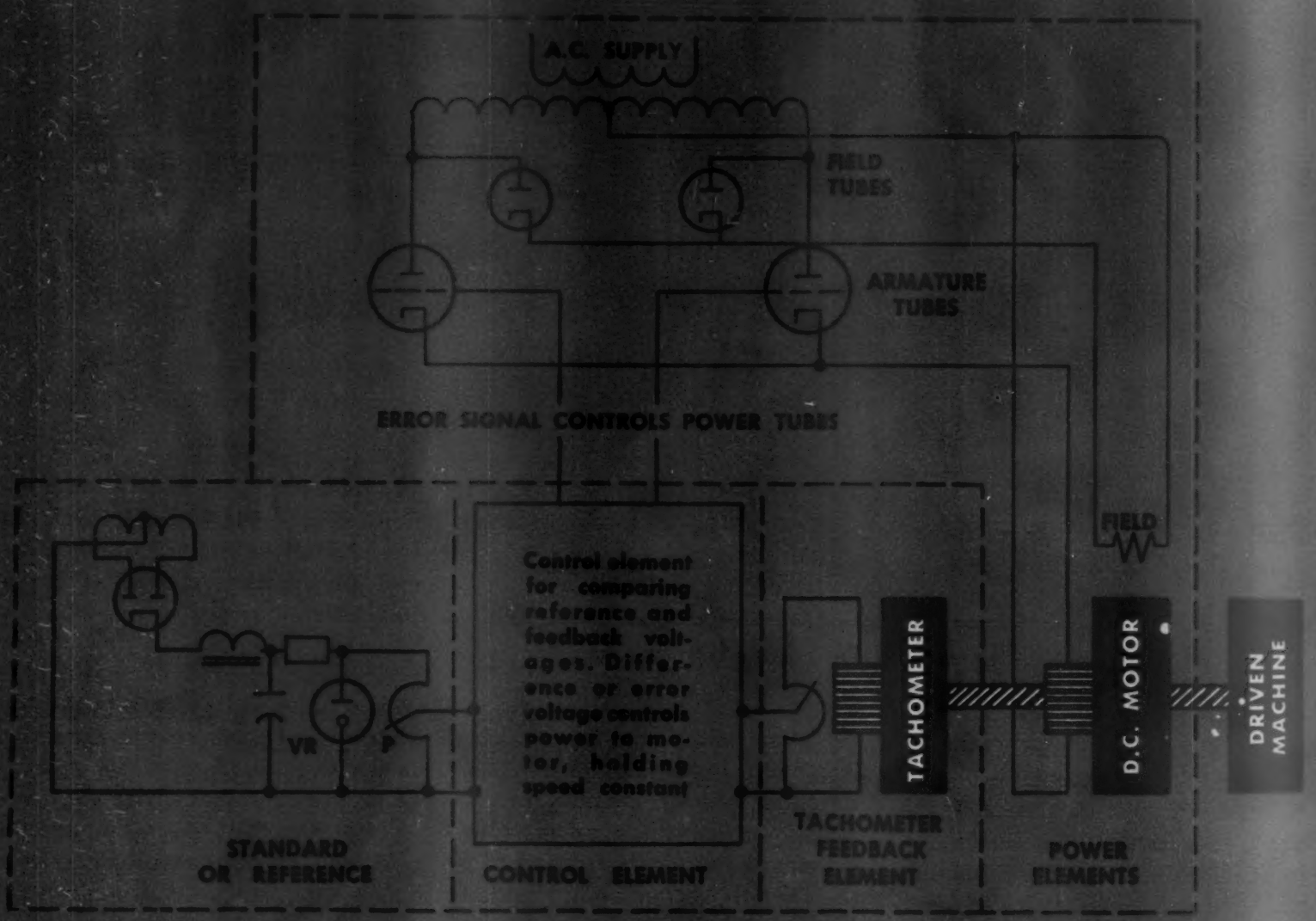


FIGURE 3. COMPLETE CLOSED-CYCLE SYSTEM TO CONTROL ROTATING SPEED, USING A TACHOMETER FEEDBACK ELEMENT

ometer (P) shown to any desired value. When used to supply reference voltage alone, and not used for other power demands, this circuit provides a consistent and reliable reference, having an accuracy of better than 1 per cent under normal conditions.

Figure 2B shows a rectifier using a constant voltage transformer to eliminate variations in the line voltage. This provides a somewhat more reliable but considerably more expensive reference supply. Its accuracy can be made about the same as the voltage regulator tube, although it is adversely affected by frequency changes unless a special type of transformer is used. For more accurate reference standards, more complicated systems with vacuum tube regulators, standard cells, or other devices may be used.

Control Element

The second part of the control system is the control element, which may consist of a combination of tubes, rotating equipment, and various standard control devices. Each of these in general is patterned to suit the particular industry and the functions desired. These various control elements will be described more fully in a succeeding article.

Speed Feedback Elements

The third part of this system consists of the feedback element and provides the means of closing the control loop. The forms of the feedback and the elements used vary

FIGURE 4. CONSTANT SPEED METHOD

FIGURE 5. CONSTANT TORQUE METHODS

considerably, depending on the results desired.

When the desired performance is measured by the output speed, as when matching the speeds of different sections of a paper mill drive or a conveyor system, the most reliable device for measuring this performance and providing the feedback voltage is a tachometer. Tachometers having permanent magnet field excitation usually are selected for their high reliability and freedom from external interference The output voltage is directly proportional to the rotational speed, under the condition that negligible load is taken from the tachometer, as when an electronic amplifier is used.

An example of a complete closed-cycle system, illustrating all the elements is shown in Figure 3 Here the standard or speed reference is a voltage taken from across the voltage regulator tube, *VR*. The magnitude of the speed is determined by the setting of potentiometer, *P*. The feedback element includes a tachometer that gives a voltage directly proportional to speed. Output voltage of the tachometer is matched with the standard or reference, and the error voltage used to control power delivered to the motor.

When the speed is too low, the error is greater than the normal voltage difference, and an increase in torque of the motor is called for to increase the speed. Conversely, with the speed too high, the error will be in the direction to call for a decrease of torque and consequently permit the speed to be reduced to normal. Thus a constant check is maintained on the performance, and any corrections are automatically initiated by the control element.

For many of the average jobs, however, the accuracy of speed control provided by the tachometer is not necessary, and a less expensive system is employed. This consists of regulating the armature voltage of the motor and providing *IR* drop compensation to compensate for variations in load. The *IR* drop compensation serves to boost the terminal voltage of the motor by an amount necessary to offset the internal *IR* drop and maintain a constant back e.m.f. voltage, hence a fixed speed. Figure 4 shows this characteristic in graphic form. When variations in speed caused by heating of the motor field are detrimental to the operation of the drive, the motor field current may be regulated and maintained constant by a closed-loop system working on field current.

Current Feedback Elements

If automatic control of the output torque of the motor is desired, a voltage proportional to the armature current may be used as the feedback signal. This is based on the fact that torque is proportional to the product of armature current and field flux. Assuming field flux to be constant, control of the armature current provides control of the motor output torque An example of where this type of control is necessary is on a unit stocking knitting machine. Here definite torque limits are necessary to prevent damage to the knitting needles when a mechanical fault occurs.

When straight electronic motor control is used, a voltage proportional to the current signal usually is obtained from a dual-primary current transformer. The magnitude of this voltage is determined by the turns ratio of the current transformer and the secondary loading resistor. Figure 5*A* illustrates this type circuit.

For motor-generator drives, a voltage proportional to load current usually is obtained by utilizing the drop across the motor series and commutating fields and a resistor in series with the armature. This arrangement is shown in Figure 5*B*. A modification of the same circuit using a saturable reactor has a magnetic amplifier, as Figure 5*C* shows. While the magnetic amplifier increases the voltage signal to a much more satisfactory magnitude, it introduces some time delays that are quite undesirable, and fails to distinguish current polarity. The latter fault rules out its use where both motoring and generating loads are encountered, because a knowledge of the direction power flow is essential for proper control

Still another method, which offers a great deal of promise, utilizes a magnetron tube capable of giving an insulated d.c. output voltage, which is a function of the ampere-turns excitation applied to the magnetron excitation coil. The current used to excite the magnetron coil may be the line current to be controlled Development of more useful magnetron tubes adapted for this type of work may open a new series of current or voltage control systems.

When control of the tension in a wire or paper web is desired, as is generally the case in all reeling

operations, center drive wind-up, one of several feedback methods may be selected. With center drive wind-up reeling systems that impose very little friction, and do not require extremely precise control of the tension, the common method is to supply a constant horsepower to the reel motor during the build-up. This is a prerequisite to holding both constant tension and constant linear web or wire speed, as illustrated by these equations:

$$Hp. = \frac{2\Pi R\ TN}{33000} = \frac{TS}{33000}$$

where $S = 2\Pi R\ N$
R = Radius of reel
T = Web tension
N = R.p.m. of reel motor
S = Web or wire speed

Constant horsepower input to the reel motor is obtained by holding a fixed armature voltage and automatically strengthening the motor field to decrease its speed of rotation as the radius of the reel increases, thus maintaining a constant web speed. Automatic strengthening of the motor field is accomplished in response to feedback voltage proportional to armature current (Figure 5*A*) and at the rate necessary to maintain the armature current essentially constant. Thus, if both the armature current, I_A, and the armature voltage, E_A, are maintained essentially constant, the requirement of constant horsepower input to the reel has been fulfilled as indicated by the equation:

$$Hp. = \frac{E_A \times I_A}{746}$$

The basis for setting up the constant-horsepower system can be more easily understood from these facts:

1. As the reel diameter increases, the required torque for maintaining a constant tension, T, varies directly as the radius of the reel.

2. The required rotational speed of the reel motor for maintaining constant web speed varies inversely as the radius of the reel. The natural characteristic of a d.c. motor controlled in the field range is to match these two requirements automatically, as illustrated by Figure 6.

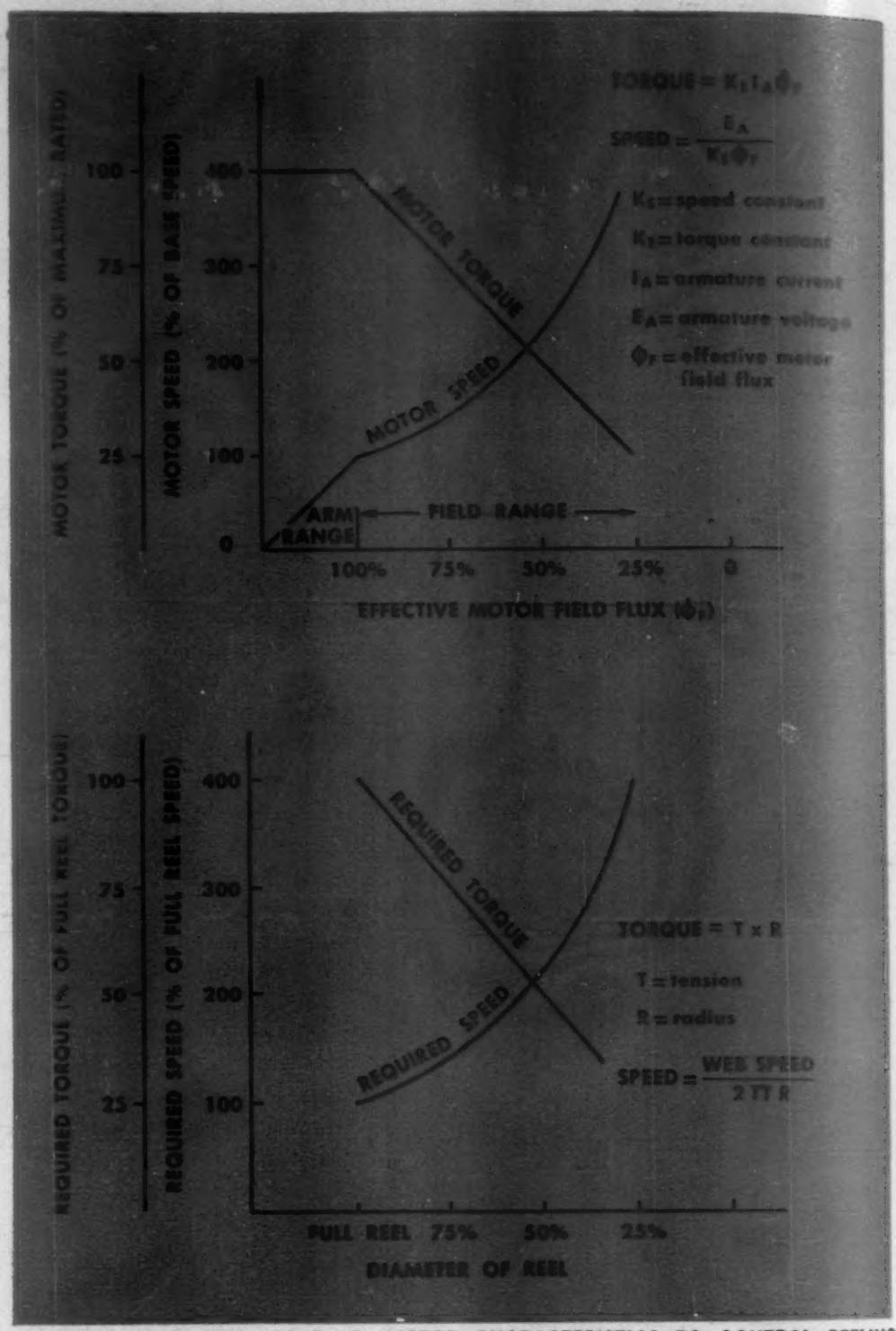


FIGURE 6. UTILIZATION OF D. C. MOTOR CHARACTERISTICS TO CONTROL REELING OPERATION

Dancer Roll Control of Tension (Center Drive Reel)

In systems where precise control of tension is necessary, approximation methods, such as the constant-horsepower system just discussed, prove inadequate. Here some direct means of measuring the tension is necessary. The most commonly used method is the so-called weighted dancer or rider roll. Figure 7 illustrates a dancer roll operated system.

In this system, as the weighted roll is moved up or down it initiates the speed control element of the reeling motor. Lowering of the roll means the reel is not operating fast enough and, hence, slack is gathering in the web. Any lowering of the roll should then operate the motor control system, to increase the reel speed. Conversely, a rise in the dancer roll indicates lack of proper web storage and should initiate a slowdown of the reel motor. Control is most commonly effected by means of a solenoid connected to the dancer roll. The solenoid usually is connected in the control system so as to provide a continuous adjustment of motor speed throughout the range of dancer roll movement.

For this type of system, tension in the web is determined by the weight of the dancer roll and is

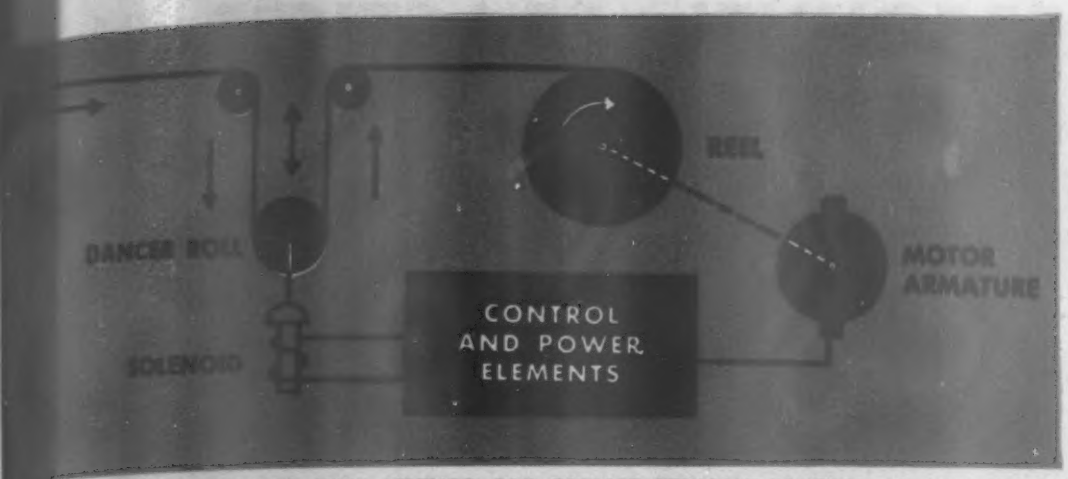


FIGURE 7. DANCER ROLL METHOD FOR PRECISE TENSION CONTROL IN WEB REELING

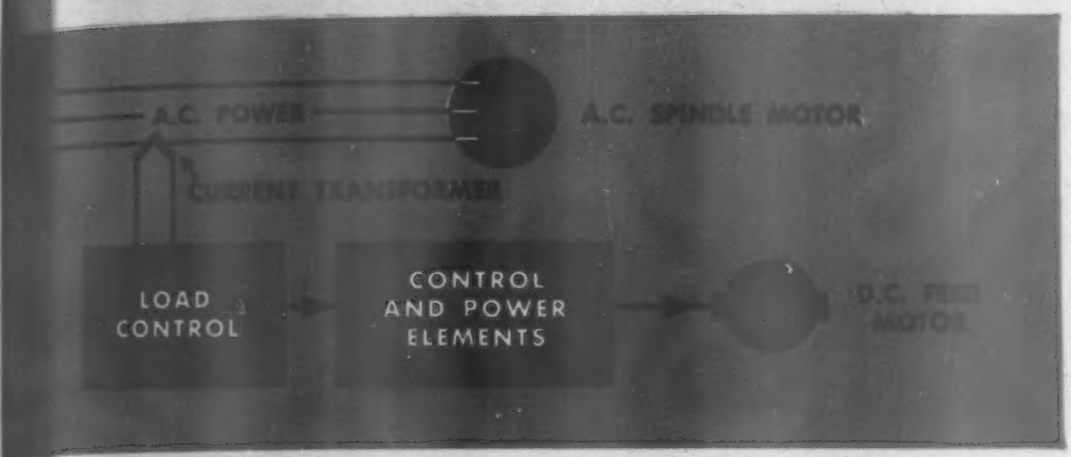


FIGURE 8. FEED CONTROL FOR SUSTAINING MAXIMUM LOAD ON SURFACE GRINDER

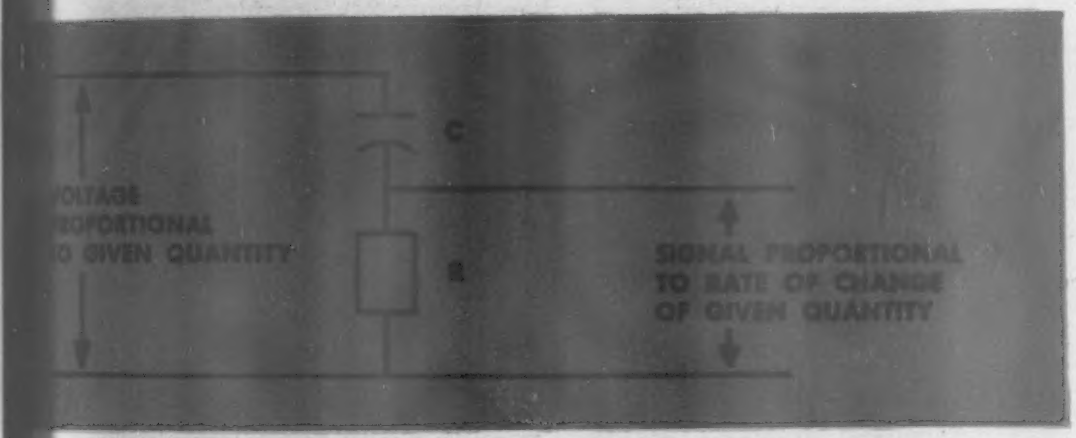


FIGURE 9. SIMPLE FEEDBACK NETWORK TO CONTROL RATE OF VOLTAGE CHANGE

equal to one-half that weight when the sides of the control loop are parallel.

For special materials that require extremely light tensions, or are in process and cannot be touched by a dancer roll, equivalent photo-electric systems frequently have been employed to indicate the position of the loop.

Although the use of the dancer roll introduces many objectionable mechanical features, as well as requiring valuable space, it does provide one of the few methods of measuring the tension accurately at all times. This system provides automatic inertia compensation during acceleration, as well as a means of maintaining tension at standstill.

Load Control

Still another function that can easily be obtained is automatic load control. In many industrial processes such as those employing grinders, it is frequently desirable to operate the system at a maximum rate consistent with the rating of the grinder motor. A good example is a surface grinder where it is desirable to control the feed rate so as to maintain the maximum load on the spindle motor. Such an example is illustrated in Figure 8. Here it is assumed that the load on the a.c. motor is proportional to the line current drawn by that motor, as measured by a current transformer. The output of the current transformer is modified by a load control element and, in turn, operates the motor control system to maintain the maximum feed rate permissible.

This same method of load control can be used with a synchronous or d.c. motor. Where a synchronous motor is involved, care must be taken to make sure that constant field excitation is applied.

With multi-speed induction motors, caution must again be exercised, since the measurement of load current does not give a true representation of the motor load, because of the exceptionally high changes in power factor on low-speed connections.

Other Control Functions

In addition to controlling many variables, it is often desirable to be able to control the rate at which these variables are permitted to change. To obtain a signal proportional to the rate of change of any given quantity, a simple network consisting of a capacitor and resistor, as shown in Figure 9, provides the necessary feedback element. Here it is required to obtain a voltage proportional to any given quantity whose rate must be controlled. By proper choice of the resistance and capacitance, the voltage drop across the resistance will give a fairly accurate means of control. This method is regularly applied in control systems to regulate the rate of rise of armature volts, armature current, and motor speed and can be applied to many other functions.

While the control of various quantities such as speed, torque, tension, and load have been indicated, it is by no means complete coverage of the subject. The closed-control system can be as advantageously applied to the control of position, temperature, vibration, and many other measurable quantities. No further space will be devoted to the control of these functions, since in general they will follow the same patterns already outlined. However, some will be discussed along with some of the more interesting applications to be described in a succeeding article.

BIG-PLANT PERSONNEL PRACTICES IN

Proof again that small plants can do the same things big plants do—and, because of their size, do them even better

CARL O. NELSON • PERSONNEL DIRECTOR, TRI-CLOVER MACHINE COMPANY, KENOSHA, WIS.

SIZE of plant has nothing to do with the maintenance of good employee-employer relations. Not, that is, if experience at Tri-Clover is worth anything.

Ours is only a 225-man plant, but we are using most of the techniques the big plants use. And using them successfully. Far from being a handicap, our small size enables us to add the personal touch that is so often missing in the big plant's program. After all, the average man is just another fellow like ourselves. He wants to make a living. He wants to get along with other people. If he happens to be a Tri-Clover worker, we know we're going to have to spend a lot of time together. We must pull together. Why not be considerate and pleasant about it? We sincerely try to be.

As to other plants, we utilize many techniques common to the field of personnel administration. They have been borrowed, altered, and adapted to our needs, and, because we do not have a large staff, they are often not so detailed in their application as they may be in larger organizations. A brief summary of some of our techniques and procedures is shown below and on the following page.

1 RECORDS AND REPORTS. The core of our records is the individual personnel folder. This consists of a double-window celluloid envelope, 6x9 inches in size, open only at one 6-in. end. Visible from the outside on one face is the personnel record, and on the other face the job and salary record. The two records are printed on a piece of stiff paper of usual typewriter size. Within the fold of this record are kept other records of the employee.

In the event of separation, the celluloid envelope is replaced by a manilla envelope with a clear small window. In addition to records accumulated during the term of employment, this folder, which is held in our inactive file, contains a separation notice, an exit interview report, and any recommendation given.

We keep also a simple monthly employment report, a length of service list, a seniority list, and an absence report, which is kept on a department basis as well as individually for each employee.

We employ a full-time registered nurse who doubles as a personnel clerk. She keeps compensation claim records and reports, group insurance records and reports, and both a daily and monthly report of accidents and injuries. She also orders and provides goggles and other personal protective articles for those who need them.

2 HIRING. Hiring is done through the personnel manager. The immediate supervisor or foreman has a voice in any selection, and he is practically never overruled either by his supervisor or the personnel department. Although we do not yet employ testing procedures, we have made a study of this technique, and may soon use it.

3 SEPARATIONS. The foreman has authority to discharge in cases of flagrant violation of rules or great dereliction of duty. However, in practice, virtually every case of dismissal comes to the attention of the personnel manager before it occurs.

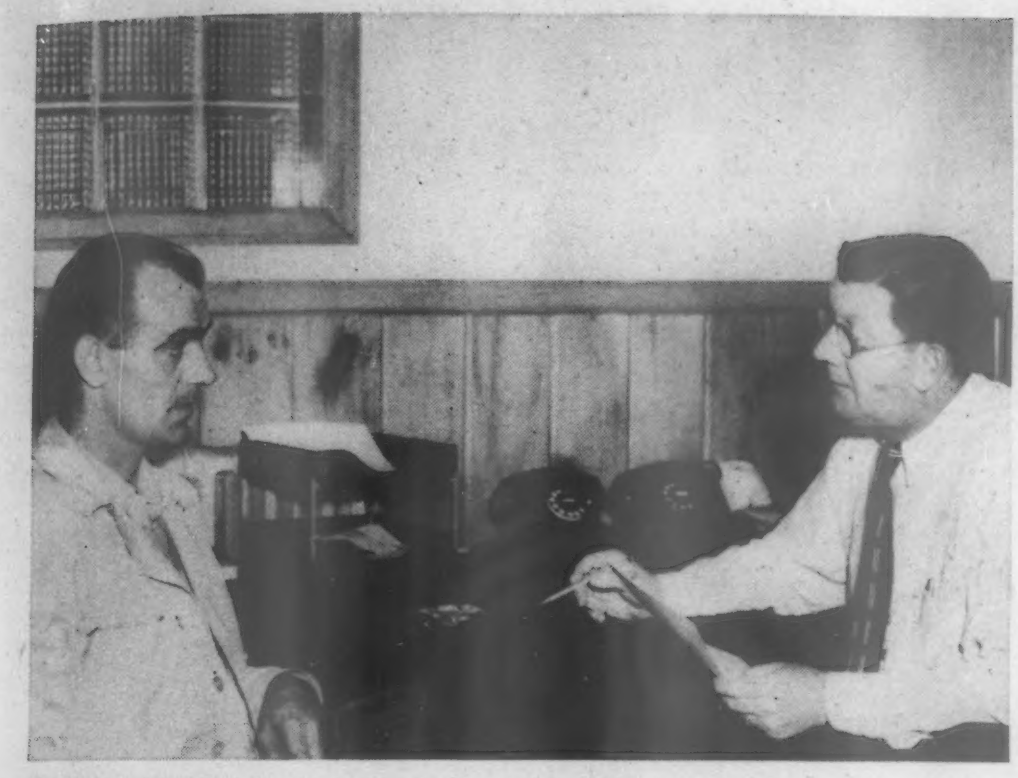
4 GRIEVANCES. We have for some time spent considerable effort in building up our foreman. In the important respect of settling grievances he comes first. He is not short-circuited, because the employee must first take up any grievance with him. If it is not settled, it is taken to the superintendent, and then to the personnel department. In our unionized departments the route of a grievance is foreman, superintendent, and the bargaining table. Rarely does a grievance go beyond the superintendent for jurisdiction.

5 WAGES. Our wage rates are as high or higher than those in most shops in our area. Within the past two years a sound incentive plan has been adopted in all departments where it is feasible. It has been well accepted, has increased production, and has made possible substantially better earnings for workers.

6 JOB EVALUATION. Our industrial engineering department, in addition to setting up and maintaining wage incentives, has the responsibility of setting the standards for our job evaluation program. This is a continuing job, because of the many changes and improvements in methods that take place. We use a point rating system to make the comparisons. We have not yet perfected a merit rating plan, but we are studying the matter in order to arrive at a sound procedure.

7 PROFIT SHARING PLAN. Three years ago a profit sharing pension plan was set up. Through it we expect that each permanent employee will have had built up on his behalf a substantial sum of money for his retirement, to augment his social security or income from other sources. Under certain conditions, employees who do not remain until retirement age may claim part or all of the money that has been credited to them upon their separation from the company.

A 225-MAN SHOP



AUTHOR (right) talks things over with a job applicant. Actual hiring is done by the personnel manager, but the foreman has a voice in the selection of his workers

8 GROUP INSURANCE. A recently liberalized group life, hospital, and surgical insurance plan is in operation. One feature of the plan permits the building up of a cash surrender value on the life insurance. In the event of employee separation, this cash may be collected or it may be converted into a paid-up policy.

9 SAFETY. Safety and first aid are administered through the personnel department, although the primary responsibility for safety is in the hands of the foreman. The personnel manager conducts monthly inspections. The superintendent and the chief engineer alternate in accompanying the personnel manager on the inspection tours.

10 SUGGESTIONS. We have had a suggestion system for several years, and recently have greatly liberalized the awards. At present we are allowing 20 per cent of the first year's savings in labor cost, and 10 per cent of material savings. Suggestions on safety, housekeeping, and similar items are paid for on a flat basis. At first we carried on the work through a committee, but, although this is a small plant, with quick communications, we still found the committee too slow. For the past year, therefore, we have placed all suggestions in the hands of the industrial engineering department. Time has been saved, and employees have received their answers quicker.

11 CREDIT UNION. Our credit union is run entirely by employees, but the personnel department assists in the clearance of information, and the company permits individuals to spend company time in keeping records.

12 LEGAL ADVICE. Employees with minor legal problems are free to go to the company attorney for advice and information, thus eliminating some of the small worries that occasionally beset them. Notary public service and income tax aid are also provided at no charge.

13 EMPLOYEES' CLUB. In cooperation with the company, our employees' club promotes social and recreational activities, including an annual picnic and a Christmas party. With financial aid from the company, it edits and publishes a monthly paper. Opportunity for athletics has been provided for those who are interested. There is a baseball team, bowling team, and golf tournaments. Bimonthly, a combined social and business meeting is held, usually with friends and relatives in attendance.

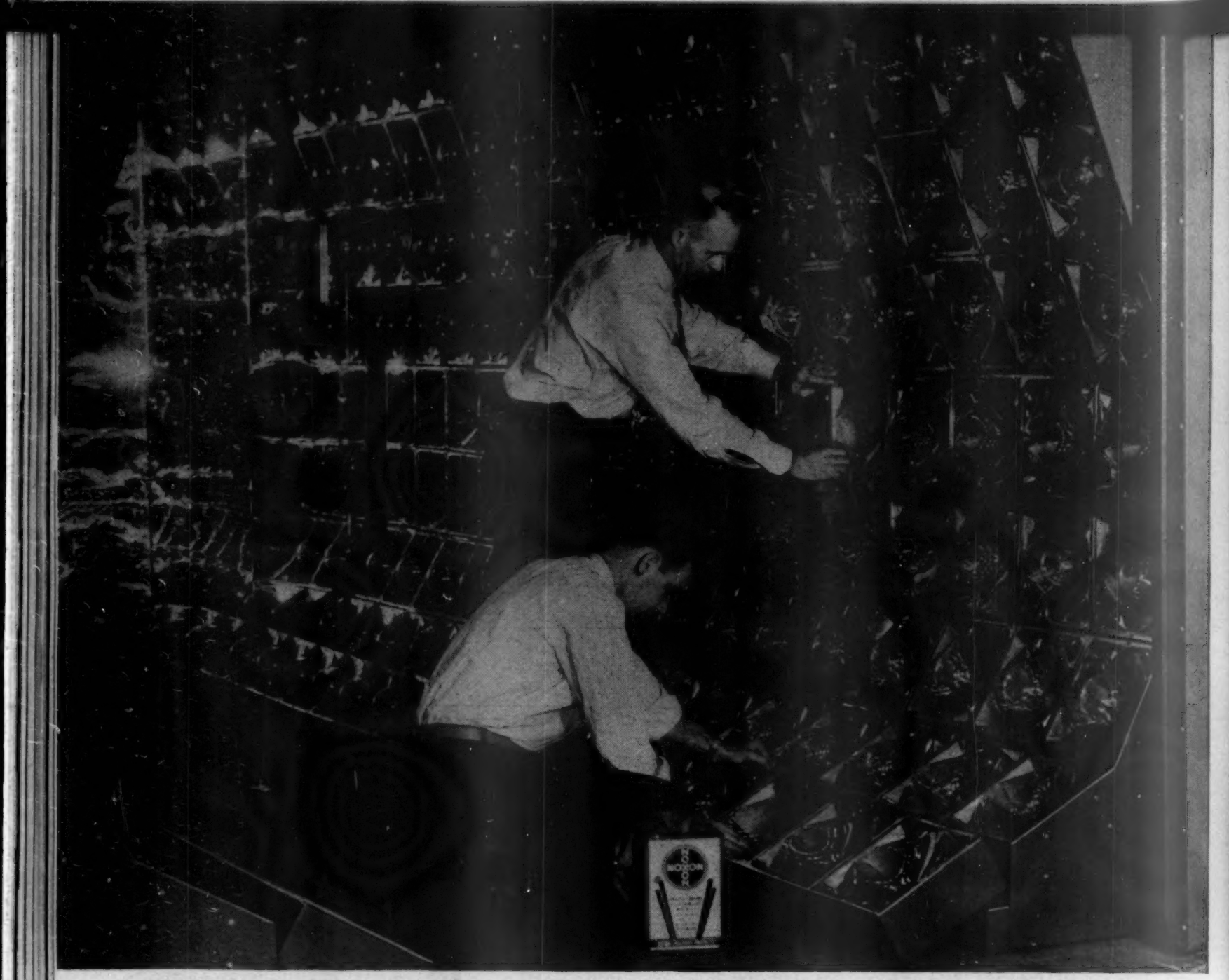
14 FOREMAN TRAINING. Foreman training meetings are held weekly. Our executive staff participated in a conference training course conducted by an outside expert, and the staff in turn took over the leadership of the foreman conferences, but the executive staff also holds its own weekly meetings. Visual aids are used extensively, and a film strip projector with sound and a movie projector with sound are available.

Further information on our procedures, including company policy, is given foremen through written standard practices. On special occasions, foremen are called together for the discussion of a new procedure or policy. Several times a year there is a get-together of foremen and executives for a social evening.

15 MISCELLANEOUS SERVICES. Within the limits of available space, we provide parking. Advice is sometimes sought and given on personal problems. We permit employees to be called to the telephone or to call out in emergencies. Messages of importance are forwarded, even though not of an emergency nature. Our employees' club sends flowers to sick employees, and the foreman, superintendent, nurse, or personnel manager calls—not to check up, but in a friendly spirit.

Also there are several little things we do because we like to do them, and because they make our personal relations more pleasant. For example—a birthday remembrance. Every person on his or her birthday receives a 2-lb. box of candy, presented by his foreman or supervisor.

And our president mails a letter to every person on his employment anniversary date. On their fifth, tenth, fifteenth, and twentieth anniversaries, he personally presents employees with service award pins. Our service recognition by the president has been well received.



CLEANING an oven every three months is usually adequate to keep it within 3 or 4 per cent of optimum efficiency, but the frequency varies greatly with the surroundings. Some ovens are cleaned weekly; others after years of service

HOW TO MAINTAIN INFRA-RED

To get the best from infra-red equipment, keep it clean. Here, the best methods of cleaning, and how often to do it

IRA J. BARBER • DIRECTOR OF ENGINEERING, FOSTORIA PRESSED STEEL CORPORATION, FOSTORIA, OHIO

PROPER maintenance of infra-red equipment used for drying paint coatings and various other purposes, involves several interesting points inherent in the process. In general, there has been a perfectly natural tendency on the part of many to assume that the visual appearance of the reflective equipment was a safe way of appraising its performance. Field and laboratory experience indicates that in many instances this is an unwarranted assumption.

A clear understanding of how infra-red equipment functions, is essential to effective maintenance. Any heated object gives off electro-magnetic radiations known as infra-red. These radiations are not visible, but in many respects they behave essentially the same as light rays. For example, they do not need a carrier, as does convected or conducted heat, and can be reflected and redirected in the same way as light.

In the type of installation with which we are concerned here, the infra-red radiation is supplied by filament lamps. Such lamps may have either a carbon or a tungsten filament. Also, the reflecting surface, which serves to direct the radiation, may be incorporated in the lamp, or it may be a separate unit. The kind and arrangement of lamps and reflectors depend on various factors, such as the wattage required and the nature of the service.

LOOSE DIRT that may have accumulated can be blown off with a compressed air blast

OVENS

Since an infra-red oven with the proper reflectivity may be as much as 500 per cent more efficient than a non-reflective oven, it is important that reflectors be suitable, and be kept in good condition.

On this point two facts must be kept in mind: (1) The reflector is any part of the oven that is "visible" to the filament; (2) surfaces or materials that are efficient reflectors of light may be relatively poor reflectors of infra-red radiation.

Many materials might be considered for use in providing reflective linings, but they must meet the following tests: They must have high reflectance, resist corrosion, heat,

GENTLE CLEANING, NOT HARD RUBBING, HELPS PRESERVE LAMP LIFE

REMOVE OVERSPRAY by dissolving with a solvent rather than by hard rubbing with some polishing material

CHOOSE an abrasive-free polish. Avoid pastes in favor of liquids. Minimum rubbing means longer life for reflectors and lamp bulbs

and moisture, and be easily cleaned. These requirements are simply stated, but few materials will adequately meet them. Copper and silver have high reflectance, but will not resist corrosion. Chromium stands up well in service but has poor initial reflectivity. Aluminum must be anodized to provide suitable reflectance, and will not stand the heat well. Painted surfaces are not high in reflectance, and are difficult to clean. Gold comes closer to meeting all the requirements than any other material; hence it enjoys the widest use. To illustrate the disparity in reflectance, the following temperatures were found on a series of end baffles, identical except for the surface:

Oxidized aluminum lighting sheet	198 deg. F.
Gray painted steel	195 deg. F.
Aluminum painted steel	158 deg. F.
White-enameled steel	140 deg. F.
Gold-plated steel	117 deg. F.

These temperatures are a measure of reflectivity, or its complement, absorptivity.

Gold is apparently the longest lived of all the foregoing materials used in ovens. It is permanent when properly plated over nickel, but is migratory over brass, at elevated temperatures. For this reason, brass-base reflectors have not been in use since this peculiarity manifested itself. Reflectors are now in service that have been used for nine years, since the inception of the process, have never been replated, and are still in good condition. They are steel-base reflectors with copper and nickel intervening coats.

The time between cleaning periods varies considerably with the surroundings and the general quality of factory housekeeping. Some installations are cleaned weekly, whereas others have had their first cleaning after four years of service. There is, of course, no reason to touch an oven that is not obviously dirty, regardless of its length of service. In many modern air conditioned plants, annual servicing undoubtedly suffices. In other locations, equipment requires cleaning in two or three months. In general, cleaning an oven every three months keeps it within 3 or 4 per cent of its optimum efficiency.

Many plants operate on a schedule whereby one-third of an oven is cleaned each month. In this way the entire oven is cleaned every three months, and the operating level is constant the year around.

Cleaning methods, like cycles, vary with the problem. In many cases it is possible to blow off with an air blast any loose dirt that has accumulated. If overspray has accumulated, it is best removed with a solvent or with paint remover. It is better to remove such coatings by dissolving them, rather than by hard rubbing with some polishing material.

Incidentally, any oven that accumulates overspray is too close to the spray booth, adequate booth ventilation is not provided, or the operator is spraying out of the booth. Overspray in an oven is an indication of the existence of a hazard that should be corrected.

In general, where a polishing material is employed, one should be chosen that is as free as possible from abrasive. Pastes should be avoided in favor of liquids, and the one that requires the least rubbing will prolong the life of the reflectors the longest.

Little Cleaning Needed

Infra-red lamps require relatively little cleaning except when exposed to overspray. Here, again, paint remover is recommended. Usually, however, dust accumulations may easily be removed at the time of general oven cleaning. Care should be taken to avoid hitting the lamps against metal oven parts while cleaning, to prevent starting tiny checks that eventually cause failure. This is particularly true of the relatively fragile R-40 or reflector-type lamps.

Tungsten filament lamps, which are now in predominant use, have a depreciation throughout burning life of only about 5 per cent on the average. This figure applies to clear lamps. Reflector-type lamps have a somewhat higher depreciation, because some of the filament is sublimed and deposited on the self-contained reflective surface. Therefore, unless lamps are prematurely blackened, it is considered good economy to let them serve their life span in the oven. This span is normally considered to be about 5000 hours, but it is influenced by the type of work being processed and the ambient temperatures to which the lamps are subjected.

The T-40 1000-watt pigtailed lamps, in use in the ceramic, paper, and textile fields, have thus far shown phenomenal life—above 10,000 hours average to date. We find no evidence to support any feeling that a lamp should be replaced prior to its actual failure, and believe that any such policy of premature replacement is wasteful.

Of the various types of ovens, including home-made ones, it will be evident that some have linings of negligible reflectance. Over this type of equipment, the reflective oven offers a plus-value of considerable magnitude. If no cleaning program is set up, however, and the equipment is allowed to get very dirty, its efficiency will drop to the level of the non-reflective job. While it is just as effective as a clean non-reflective oven at this stage, the additional operational cost will easily pay for the labor of cleaning. Failure to keep an oven clean must be regarded as poor economy.

Inert or idle storage is more responsible for oven depreciation than hard usage. If an oven is to be temporarily out of service, it is advisable to cover all reflective surfaces with oil or grease, in order to hold them at operating level. Such action saves the polishing and cleaning required later on to restore the reflective surfaces to their initial condition.

Reflectance of Linings

A recent conclusion is that the factors of maintenance and depreciation do not differ materially in the two general types of infra-red ovens—that is, the clear lamp plus good reflector type, and the self-contained reflector-lamp type.

Tests on ovens in daily use in the Fostoria plant were made by taking progressive depreciation measurements over a period of one full year on two similar ovens which were not touched for cleaning or relamping. Total operating hours during this time were slightly over 2000. The ovens were "rated" periodi-

cally, using standard targets and carefully checking over-all input.

The room in which the ovens under test are located is also the area housing three water-wash spray booths, which are force exhausted. Separation of the ovens from the spray booths is from 5 to 6 feet, which is closer than would normally be recommended in a good installation. Distances of 10, 15, and 20 feet are embodied in suggested codes and city ordinances, and it is felt that going under 10 feet is poor practice, not only from the standpoint of safety regulations, but also to minimize overspray reaching the oven. The room is not pressurized, and no special attempt is made to keep it cleaner than the rest of the plant. Therefore, it appears that the test covers conditions at least no better than would be found in the average installation.

Depreciation in a year's time barely reached 25 per cent, which includes some lamp depreciation. At the end of that time the oven was visibly very dirty, but a good share of the visible dirt could be blown off by an air hose in a few minutes.

Cleaning an oven is not a particularly difficult job, if the correct materials and techniques are employed. It has been found, again by experiment, that one man can easily clean and polish 70 to 80 reflectors in an hour. It is certainly safe, therefore, to use a figure of 50 per hour as a basis for maintenance costs. On a 3-month basis, one man-hour per month may be charged for every 150 reflectors in the oven. At 250-watt lamping, this could be translated into one man-hour per month for every 37½ kv. of connected oven load.

Where reflector lamps are employed, an oven of the same physical size has almost the same effective area of reflective surface to be cleaned, so that little difference in maintenance cost exists.

Matte-finished oven interiors, such as aluminum painted, may have an initial reflectivity as much as 75 per cent that of gold, but they deteriorate more rapidly through collection of dust and dirt on the rougher surface.

From the foregoing several facts stand out:

1. A good reflective lining is indispensable to an economical, infrared oven. Of the reflective materials in current use, gold appears to give the best all-around performance.

2. It is economically good business to maintain the interior of an oven in reasonable operating condition. Cleanings should be no more frequent, however, than the need. Average good housekeeping will indicate cleaning at from 3- to 6-month intervals.

3. Lamps, which require little special maintenance beyond cleaning along with the oven, are better left to serve their normal life in the oven rather than be replaced at some predetermined earlier time.

4. Failure to maintain an infrared oven is uneconomical in the same way and to the same extent as with any other production machine. With any type of oven the cost of maintenance is eventually paid for, in one way or another.

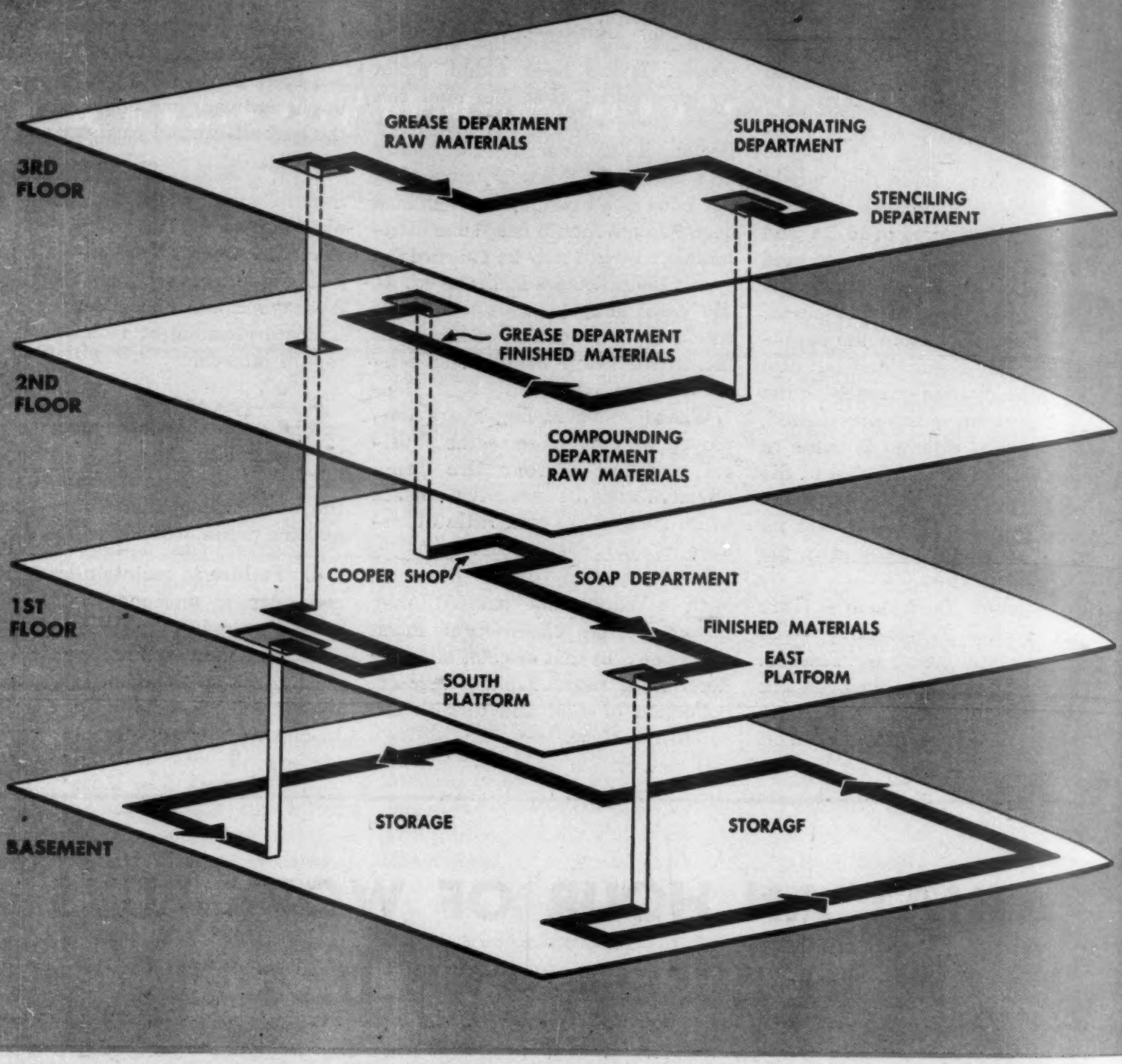
WHAT AN HOUR OF WORK BUYS IN RUSSIA AND U. S.

AMERICAN wage earners who think they are not well off might well be given a look at the accompanying list of items selected from a table prepared by *The New York Times*. It shows how workers fare today under free and managed economies. The yardstick used is the fairest available—*average hours of factory work required to purchase comparable items.*

American prices are those prevailing in a large chain of food stores. Equivalents in hours of work were computed at the rate of $1.238, the BLS estimate of current average hourly earnings in all industries.

Soviet figures are based on a 48-hour week and monthly wage of 500 rubles, one hour equaling 2 rubles, 41 kopecks new currency.

THE SOVIET UNION			THE UNITED STATES		
	Average Cost in Work			Average Cost in Work	
Commodity	Hrs.	Mins.	Commodity	Hrs.	Mins.
Rye bread, 1 lb.		31	White bread, 1 lb.		07
White bread, 1 lb.	1	10	Whole wheat bread, 1 lb.		07½
Rye flour, 1 lb.		50	White flour, 1 lb.		05
White flour, 1 lb.	1	19	Whole wheat flour, 1 lb.		08
Macaroni, 1 lb.	1	41	Macaroni, 1 lb.		08
Sugar, lump, 1 lb.	2	34	Sugar, lump, 1 lb.		05½
Calf meat, 1 lb.	5	15	Veal chops, 1 lb.		34½
Salted butter, 1 lb.	10	42	Salted butter, 1 lb.		48½
Vegetable oil, 1 qt.	11	30	Vegetable oil, 1 qt.		47
Fresh fish, 1 lb.	1	59	Salmon steak, 1 lb.		36½
Ground salt, 1 lb.		18	Ground salt		03
Milk, 1 qt.	1	18	Milk, 1 qt.		10
Eggs, best, 1 doz.	4	57	Eggs, best, 1 doz.		38½
Tea, 1 lb.	11	00	Tea, 1 lb.		39½
Coffee, 1 lb.	14	06	Coffee, 1 lb.		22½
Beer, 1 bottle	2	51	Beer, 1 bottle		06¼
Washing soap, 1 bar	2	10	Laundry soap, 1 bar		05
Toilet soap, 1 bar	1	39	Toilet soap		05½



SCHEMATIC LAYOUT OF ENDLESS CONVEYOR SHOWS HOW IT DELIVERS MATERIALS TO ANY PART OF MULTI-STORY PLANT

MULTI-STORY HANDLING BY CONVEYOR

Steel drums and barrels ride a conveyor up and down through four floors — thereby saving $10,000 a year

THOUSANDS of large steel drums and barrels are automatically transported daily throughout E. F. Houghton & Company's 3-story-and-basement "oil-manufacturing plant A" in Philadelphia.

By means of a continuously moving endless conveyor, heavy drums can be as easily moved from one department to another as though each were a next-door neighbor. The installation already has saved the company well over $10,000 annually for several years in drum handling costs. It also is adding to plant operating efficiency.

In effect, the set-up is conceivably better than a single-story layout. It permits the advantages of practically door-to-door relationship of all departments to prevail in an existing urban plant where ground space for expansion is at a premium. Also, it does not disturb the efficient application of gravity-flow principles to the manufacturing processes being carried on in a multi-story building.

THE PROBLEM: On each floor of the 250x250-ft. plant there are two or more major manufacturing departments which are independent and non-sequential in processes and products. Operations involve job-lot manufacturing and compounding of some 1000 finished products made from over 2100 kinds of raw materials, most of which are received and shipped in standard 55-gal. steel containers.

Because of the limited working floor space, it is not advantageous to store drums of raw material or finished products in manufacturing departments. They must be kept in the large basement where space is available, and called for as needed. More than 1000 drums of work-in-process must be moved each day throughout the plant.

In addition, a supply of new empty drums must be received, kept available in storage on the third floor, and distributed to all manufacturing departments on call.

THE SOLUTION: A 1650-ft. overhead chain-driven conveyor winds through all major departments and storage areas on all three floors and basement of the building. It has 146 rectangular platform carriers suspended on about 11-ft. centers in iron frames hanging from a monorail. This for the most part keeps the platforms flush at floor level.

Each platform is designed to hold one full drum that can be rolled on its side from the floor onto the slowly moving platform, or two empty drums that can be set on end. Each platform is supported by a dead-roller guide wheel under its front and rear ends which rides in a depressed U-track in the floor, and minimizes the wear on the chain that might be caused by load and side-thrust forces. Drums are kept from rolling off the platform by a safety drop bar on each side.

Layout of the route of the conveyor on the facing page shows its entire path, beginning at the south platform on the first floor, where the one and only starting pushbutton is located. There are 25 emergency pushbutton stops throughout the conveyor's length, but no other starting switch. A loud buzzing signal automatically warns all departments when the conveyor is to be started.

Other safety features include (a) provision of safety dogs on all inclines to prevent chain slippage, should a break occur, and (b) fuselink positive-action firedoors in all conveyor openings in firewalls between departments, which are designed to stop the conveyor automatically when they close. These can also be manually operated.

Power requirements for the conveyor are two 7½-hp. motors. One drive is located at the starting switch and the other on the third floor. Carriers are identified by numbers running 1 to 146 consecutively. A complete cycle takes about 30 minutes.

To supplement the conveyor for low-cost drum handling, many receiving and agitation tanks in manufacturing areas were placed below the floor level. Hence, drums can be rolled only a few feet off the conveyor platform and emptied into a spill drain over these tanks. Likewise, the finished product is drawn off into drums from pipe outlets on the floor below.

HOW IT WORKS: All storage of many thousand drums of raw materials and finished products is handled in the basement. Here the drums are stacked four-high in steel racks where they are easily placed or removed by an electric portable hoist. Racks are located in the center floor portion, while the conveyor follows the wall.

Just before a foreman of a manufacturing department is ready to process a "formula" order, he tells the basement storage room over the communication system exactly what raw materials he wants. This order is confirmed in writing for record purposes. In the meantime, the basement storage room puts the ordered drums onto the conveyor and notifies the foreman of the carrier numbers.

Partly emptied drums remain on the manufacturing floors. For a specified period each morning,—and only then, to the exclusion of all other loads—completely emptied containers are returned by the manufacturing floors. A crew is stationed at the shipping platform to take off all "returnable" drums. Company-owned drums that require reconditioning are taken off at the "cooper shop" to be steamed, washed, dryed, and painted. Except for this scheduled period, all departments notify each other of material dispatched on the conveyor.

Empty containers for product shipment are obtained from the third-floor stencil department. Customarily an average stock of ten carloads of empty drums is kept on hand in this department. Stock is obtained from new purchases coming up from the receiving platform, or from the cooper shop. It distributes "empties" according to orders received from any department simply by placing the required number of drums on the conveyor.

When finished stock is poured from process tanks into drums by a manufacturing department, the drums are sent on the conveyor either to the basement for storage or to the "oil room" on the first floor for sampling and preparation for the shipment of a specific order. At any time later, the drums in basement storage can be rerouted to the "oil room" for shipment.

Thus it will be seen there is no limit to the variation in routing of drums from any one department to any other. This flexibility has met the need of a low-cost method of transportation in an otherwise inflexible building layout.

Every Month . . .

AMONG THE ADVERTISING PAGES, these valuable aids to low-cost production: the plant operation man's guide to **WHAT'S NEW IN EQUIPMENT** (page 136) . . . a summary of **LABOR DEVELOPMENTS** (page 202) . . . things **YOU WANT TO KNOW** more about (page 192)

OPERATING SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary operating accomplishments. Accepted articles will be paid for

CONVEYOR SYSTEM STORES PARTS, SPEEDS LOADING

Feeder lines off the main conveyor allow all packaged small parts making up an order to be stored together. When a truck comes in for loading, an extension conveyor is run into it from the main conveyor, and the waiting packages are rolled in and stacked

Besides providing segregated storage for the many small parts shipped out by The Weatherhead Company, Cleveland, the recently installed roller conveyor system permits simultaneous loading of four trucks. This has reduced the number of shipping room personnel required from four to two men, and the total time required to load shipments from several hours to a matter of minutes.

Weatherhead makes some 40,000 kinds of small parts, shipped out in small containers. Formerly these containers were brought into the shipping room by both power and hand truck, and were laboriously stacked in piles according to trucker and destination. Later, when the truck arrived at the loading platform, each container had to be handled again, passed into the truck, and stacked there.

Now packages arrive in the shipping department by roller conveyor, where they are shunted off onto one of the many feeder lines. This allows all small packaged parts making up an order to be stored together. When a truck comes in for loading at one of the four stations, a portable extension conveyor is run into the truck, and the waiting packages are rolled right in.

SPECIAL LADDER FOR FLUORESCENT LIGHTS

JAMES C. SMITH, Maintenance Manager, The Hallicrafters Company, Chicago

Maintenance men no longer have to hand carry or push trucks containing their supply of ladders, fluorescent tubes, and cleaning pails to change lights or clean reflectors at The Hallicrafters Company, Chicago.

Their job has been simplified and made easier through the design of a ladder on wheels (see illustration in right hand column). A full carton of 24 fluorescent tubes can be carried on one shelf (*A*) at the top of the ladder. Cleaning pails and other miscellaneous supplies can be placed on another shelf (*B*).

Maintenance men merely push this ladder to the section of the plant where they intend to work. Climb the ladder, drop the brake arrangement (*C*), and all supplies are at their fingertips ready for use.

The brake mechanism is simple. It works by dropping a weighted 2x4 wooden shoe, T-shaped with a ¼-in. felt pad on the floor side. In the down position, the felt pad gives the required adherence to the floor surface. No longer is an extra man required to hold or steady the ladder while the other man is working above

If another fixture is nearby that requires service, it is not necessary for the man to climb back down. All he does is lift the brake and pull himself along to the next station via some overhead structural member.

The results have been startling. Accidents caused by men slipping from ladders or dropping supplies have been completely eliminated. Maintenance time for cleaning fixtures or changing fluorescent tubes is considerably reduced, perhaps because the men are more sure of themselves on this ladder. Quality of work has been improved and workers like the new method.

PLANT TOUR FOR NEW EMPLOYEES

To assist new employees to gain a general familiarity with the plant, new day-shift workers are being given the opportunity to take a 2½-hour trip through the plant at Lederle Laboratories, Inc., Pearl River, N Y. Groups are limited to eight. If the number of new employees for one week exceeds this number, additional trips are scheduled.

It is realized that other employees

who started work before the tours were organized would benefit by the tour, and plans are being made to include them whenever groups of new workers are small enough to allow for extra members. Those who wish to take the trip may send a request to the personnel department, and are included as soon as possible.

"LET'S GET ACQUAINTED" FOLDER FOR EMPLOYEES

A neat folder, the back cover of which forms a pocket, presents to the new employee at The George Gorton Machine Company, Racine, Wis., all necessary information regarding "work and play" at this plant.

A brief description of the company's activities and products sketches in the background, and explains what is expected of those who work at Gorton. The social and recreational activities are listed, and include golf tournaments, bowling league, softball teams, picnics, dances, parties, and other events.

A series of small booklets is tucked into the pocket on the back cover. One enumerates the rules, regulations, and wage administration policy of the company. Another tells about the cooperative group insurance plan. A third explains the employee benefit association and social club, and reports the constitutions and bylaws of these groups. Still another pamphlet sets forth the union contract.

SPECIAL RACK FOR STORING SUCTION ROLLS

HEAVY SUCTION ROLLS waiting for further assembly at the Downington Manufacturing Company, Downington, Pa., are easily stored in tiers of the special steel rack shown here. Each roll is supported on two 4-wheeled saddles which ride on two I-beam rails extending from the front to the back of the rack. Rolls can be slid into or out of the rack by an overhead crane without damage to roll surfaces

"BOTTLENECK TROPHY" HELPS INCREASE OUTPUT, IMPROVE QUALITY

No one wants to have the "bottleneck trophy" in his department, so real efforts to increase production and improve quality are being made throughout the Standard Register plant

FRANK M. VOELKL, Divisional Supervisor, The Standard Register Company, Dayton

That dreaded "award," the "bottleneck trophy," is breaking production bottlenecks at the Dayton plant of the Standard Register Company. And it has accomplished its purpose without the sacrifice of quality.

A judging committee decides which department has shown the most deviation from standard, on the bases of average performance, expectancy concerning errors, re-work orders, and delays. The trophy is never given to any department because of conditions beyond its control

To date all departments that have had to accept the trophy have succeeded in getting rid of it in the minimum time—two weeks

Here are the rules of the "contest":

1. The bottleneck trophy, once "won," has to be held for two weeks.

2. Department having the trophy in its possession can, after two weeks of adequate quality production, ask for trophy to be removed.

3 If, after two weeks, no other department is further below its quota

and quality standard than the one holding the trophy, that department is obliged to retain it.

5. The trophy is awarded, first to any department that is causing any other department to lose time; or, second, to the department with the lowest percentage of its production quota.

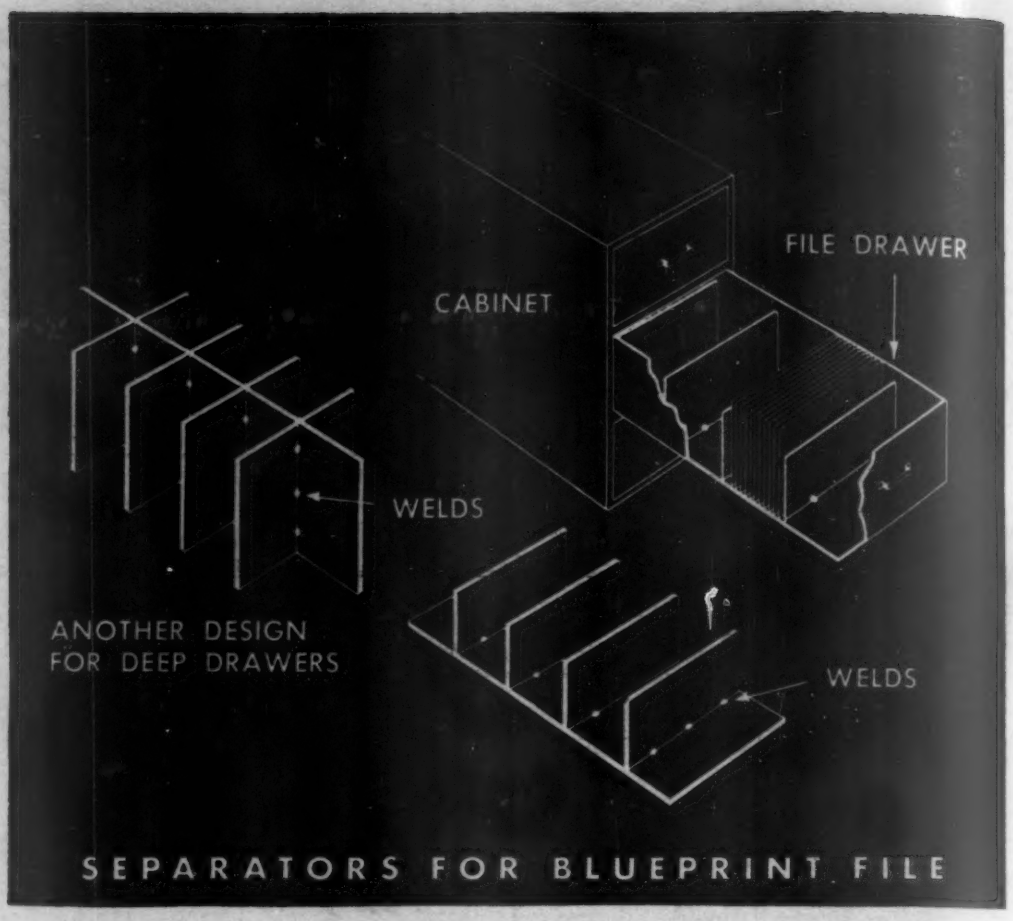
6. The foreman of the department that is relieved of the trophy has the pleasure of presenting it to its new owner.

WELDED SEPARATORS FOR BLUEPRINT FILE

CHARLES E. LAMBERT, Process Engineer, Underwood Corporation, West Hartford, Conn.

When blueprints folded to a common size are filed in a drawer, some tend to slide down, and others tend to pop up. The separator shown at the right in the accompanying sketch was designed to keep the files neat by having compartments for a given number of prints.

Made of 3/32-in. sheet steel, one piece is sheared to fit the bottom of the drawer, and the desired number of vertical members are fillet welded in place. A bond coat and then a coat of enamel prevent rusting.



At the left of the sketch is shown another type of separator for use in large, deep drawers. It can take care of two rows of cards, envelopes, or prints standing on end.

CONSPICUOUS BOARD TELLS SAFETY STORY TO ALL EMPLOYEES

Board tells complete story of lost-time accidents by departments as well as the plant as a whole

GEORGE LERO, Safety Director, Monsanto Chemical Company, St. Louis, Missouri

Using a combination of multi-colored lights, a large clock, and interesting reading matter, the John F. Queeny Plant of Monsanto Chemical Company, St. Louis, has devised a safety bulletin board that is regularly read by the company's employees on their way to work.

The board was designed at Monsanto by the safety department several years ago. It is a reinforced wood panel, 12 feet long and 8 feet high, surmounted by a large illuminated clock. Neon lighting points up the clock and is also used in the major lettering on the board.

The bottom portion of the board contains a strip divided into twelve rectangles, representing the months of the year. Green lights in these various rectangles indicate accident-free months for the entire plant. Red lights mark those in which accidents have occurred.

Glass-covered side cabinets are used to post comparative standings of the many plant departments on total accident-free days. Central numerals indicate the total number of accident-free days for the entire plant.

A large glass-covered recess in the center displays current safety posters and also contains a blackboard upon which a brief description of the latest accident is written.

The entire board, located in a runway between the plant buildings where almost every employee must walk to get to his workplace, makes a striking and attractive display. In addition to attracting the interest of the workers, it has stimulated individual and departmental competition in accident prevention.

LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

First round—18 per cent. Second round—11 per cent. Third round—?

How much will labor get this time? It's no longer a question whether there's to be a third deal on wages. What management needs to know is: (1) *How much must it kick into the third-round pot?* (2) *Will big strikes disrupt production?*

Pacesetters in CIO rely on cost-of-living rise in fixing size of their demands. They lean heavily on BLS "City Workers' Family Budget."

Here's what Reuther's UAW-CIO wants: *25¢ hourly boost, 5¢ more for health insurance, plus guaranteed weekly wage, three weeks' vacation. Pensions are left to local discretion. From General Motors, Reuther asks that 10¢ of the 25¢ hourly raise go into pensions.*

Says Reuther: The 25¢ boost—18.8 per cent—is necessary to restore "buying power" of June, 1946, when Congress cut guts out of OPA.

CIO electrical workers seek to recover $13.03 claimed loss in "real weekly wages" since January, 1945—wartime peak. This comes to 32¢ an hour. *Other demands: Severance pay, better vacations, employer-financed pensions and health insurance, more paid holidays.*

Meanwhile, John L. Lewis talks pensions for his miners. Murray wants health plan for steel workers, but can't strike for it. He'll cash in on what others get.

From Taft comes argument against further wage boosts. He uses pre-war, not wartime, base in looking at wage-price trends. Since 1939, says Taft, living costs are up 67 per cent and factory workers' take-home pay up 110 per cent.

In the end, look for increases to range between 10¢ and 15¢. There'll be more deviation from pattern this time.

●

Washington anticipates few big strikes this year. Some disruption may come from left-wing CIO unions fighting Marshall Plan aid to Europe. On the whole, management and unions will be disposed not to fuss too much. Reasons are both political and economic.

Even so, little if any improvement can be expected over last year's strike performance. Here, compared with 1946, are BLS estimates for 1947:

	1947	1946
Number of strikes	3,600	4,985
Workers involved	2,200,000	4,600,000
Man-days lost	35,000,000	116,000,000

Organized labor wants clean hands to back up its political drive to elect a favorable Congress in November. And, with living costs so high, workers have little stomach for striking.

●

Cy Ching has some ideas for taking up the slack in conciliation business. *He's cooking up a "disputes prevention" scheme. When not "fighting fires," so to speak, conciliators will keep an eye on day-to-day operation of labor contracts, try to iron out touchy situations before they break out into strikes.*

Right now Ching is easing into the critical spring period. He's beating the bushes trying to convince unions of the futility of striking and management of the need for getting along with unions.

Unions not qualified under the Taft-Hartley law will be left to their own resources to settle strikes over union recognition. That is to say, if national safety isn't imperiled. *Ching will keep hands off. And NLRB won't touch it if union is not in compliance with T-H.*

Don't look for Wage-Hour Administrator McComb to change exemption rules for executive personnel before Congress adjourns.

LIVING WITH TAFT-HARTLEY

Ball Senate-House joint committee makes its first report March 15. It finds little criticism of the law.

NLRB trial examiners have ruled against General Counsel Denham's first attempts to pin "coercion" charges on strikers. *Quips Denham: "Now I know how employers felt under the Wagner Act!"* He asks NLRB to back him up.

AFL craft unions won't always get NLRB to grant craft bargaining elections. So far NLRB has yielded to craft union demands only where job involved real skill and craft units were customary in industry. Prediction: Bricklayers will lose fight against CIO in steel mills.

When given a chance, workers vote for union shop. Up to January 1, only three elections went against it.

In bargaining elections, unions are losing ground. They are winning only 6 out of 10 elections. Under Wagner Act, they won 8 out of 10.

Plant protection workers have pulled out of UAW-CIO. They hope NLRB will permit direct affiliation with CIO as separate union. We look for NLRB to block it.

Have you filed your union agreement with BLS yet? You'll be hearing from BLS soon—asking for it.

LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

The boom can be expected to run on well through 1948.

This is the chief conclusion of a McGraw-Hill survey that filled in the last great unknown in the business outlook—*what is going to happen to capital expenditures.*

The survey is unprecedented because (1) it measures not hopes or hunches, but the firmly made plans of heads of businesses for investment in new plants and equipment, and because (2) top management men were interviewed in person in 95 cities by trained members of the McGraw-Hill Research Staff.

It is focused on business's plans to invest in new plants and equipment because these capital expenditures go hand in hand with general business through the ups and downs of the business cycle.

About capital expenditures, the survey shows:

1. Planned investment in new plant and equipment totals lower—but only slightly lower—in 1948 than the amount actually spent in 1947.

2. Post-war expansion still has more than a year to run. In the case of manufacturing, companies report that 64 per cent of their post-war programs, taken as a whole, are now complete. By present plans, 85 per cent will be complete by the end of 1948.

3. Industry's production capacity in 1949 will be far above pre-war. Manufacturing capacity will be more than 50 per cent greater than in 1939, once post-war expansion is complete.

4. Plans for 1948 are so firmly set that neither a decline in business of 20 per cent nor third-round wage increases would upset them. Of the companies with plans, 69 per cent would not change them if business fell off, only 31 per cent would cut back expenditures.

If wages rise, 15 to 20 per cent of the manufacturing companies would actually increase their capital budgets. Some 57 per cent would hold them as they are. Only 17 per cent would reduce them.

Before McGraw-Hill made this survey, forecasters could do little more than to block out capital expenditures as a large unknown. But with a high level of capital expenditures in sight, general business can be expected, in the historical pattern, to stay at a high level.

●

The McGraw-Hill survey shows also:

Manufacturing companies plan to finance their 1948 purchases of new plant and equipment largely from earnings and reserves. Three companies out of four, 74 per cent, expect to get all the funds needed from internal sources. The bulk of the funds other companies need, will come from earnings and reserves, too, rather than from bank loans or the investment markets.

Contracts for new plant and equipment in 1948 will flow through the year. One company in four now has its entire program under contract. By June 30, however, more than half the companies will have contracted for all of their 1948 programs.

Variations in expansion plans between industries and between companies within industries are interesting. Machinery, electrical machinery, and automobile manufacturers, for example, will have enlarged their 1939 capacities by about two-thirds when their post-war programs are complete. Metal-producing companies, however, are adding new capacity only 40 to 50 per cent greater than their pre-war facilities.

One manufacturing company in three, when post-war expansion is complete, will have doubled or more than doubled its 1939 capacity; 17 per cent will have from 50 to 99 per cent more capacity; and 29 per cent will have up to 50 per cent more. However, 23 per cent of all manufacturers are not adding to their capacity.

●

With the over-all conclusion of the McGraw-Hill survey that business capital expenditures will be only slightly lower this year than last, inflationary upward pressure on prices will run on in 1948.

Production will increase gradually as materials supplies ease and as productivity improves. No big increase is possible. The year's total, however, may be 6 to 8 per cent above 1947. New materials capacity, particularly in steel, plus new and more efficient production machinery, can be counted on to bring in that much of an increase in over-all production.

Employment will continue to set peacetime records. Next summer may see the 61 million job mark passed as seasonal employment reaches its peak for the year. *High employment, of course, means continued pressure for higher wages and, through its effects on personal income, a continuing pressure on prices.*

Prices, too, will continue to move up. There's still a chance that the price rise may be smaller than during 1947, however. Much depends on the weather. With fairly good crops, food prices may stabilize or decline slightly. Much will depend, too, on the pattern of third-round wage increases. But, even if it should be as high as 1947's, increased productivity may help keep price increases small.

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THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32
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management data sheet 24

MOTION STUDY FUNDAMENTALS

1. Purpose of Motion Study

a. Motion study is a tool of management which is used to analyze manual operations, to effect improvements and reduce costs.

2. Fields of Application

a. In theory, motion study may be applied to every phase of an industrial enterprise where manual activity is involved.

b. In practice, the most substantial returns are obtained when motion study is applied to repetitive operations where manual control, rather than machine control, is the major characteristic.

3. Approach to Motion Study

a. It is essential that a broad over-all survey of each office and plant be made before outlining a motion study program.

b. The extent and type of motion study analysis of a specific operation should be determined by the probable savings that would be attained.

c. Assign priority to operations where maximum cost reductions are apparent.

4. Tools of Motion Study

a. A *process chart* is a detailed record indicating the sequence of any process. It serves as an index of profitable improvements that may be made as the result of more detailed analyses.

b. An ordinary *clock* may be used to analyze losses of time in processes that require several hours or days to complete their cycle.

c. A *stopwatch* may be used to good advantage in the time analysis of repetitive operations involving several elements of relatively short duration.

d. Motion study is the analysis of the manual elements present in an operation, intended to develop an improved pattern of manual elements which will reduce both cost and fatigue.

e. Micromotion analysis is a refinement upon the stopwatch and motion study. The analysis is conducted of motion picture films of the operation.

f. Although micromotion analysis may obtain maximum savings from highly repetitive operations, its chief advantage is generally in training programs, to develop proficiency in use of the stopwatch and motion study.

5. Basic Motion Study Questions

a. From the initial broad over-all survey to the final detailed micromotion analysis, a questioning attitude should be developed, considering:

b. WHY should the work be done?

c. WHAT is to be done?

d. HOW is the work to be done?

c. WHO is to do the work?

f. WHERE is the work to be done?

g. WHEN is the work to be done?

6. Analytical Motion Study Questions

a. In approaching the study of specific operations, more analytical questions must be answered:

b. *Can the operation be eliminated?* If it cannot,

c. *Can it be combined with some other operation?* If it cannot,

d. *Can the sequence of operations be changed?* If not, then and only then,

e. *Can it be simplified?*

7. Work Elements

a. Manual operations may be broken down into work elements of *get, place, process, dispose.*

b. Work elements are generally long enough to permit analysis with the aid of a stopwatch.

8. Classes of Hand Motions

a. Within work elements, each hand motion falls within one of the classes of *finger, wrist, forearm, upper arm,* or *shoulder.*

b. These classes range from minimum to maximum time and effort.

9. Motion Elements

a. In micromotion analysis, as well as in detailed motion study of work elements, all manual work may be classified into 17 motion elements:

b. *Transport empty* (TE). Moving a transportation means, such as the hand or a shovel, without load or resistance, toward or away from an object.

c. *Transport loaded* (TL). Moving the transpor-

Prepared by Bruno A. Moski, Jr., Plant Manager, The American Paper Goods Company, Kensington, Conn.

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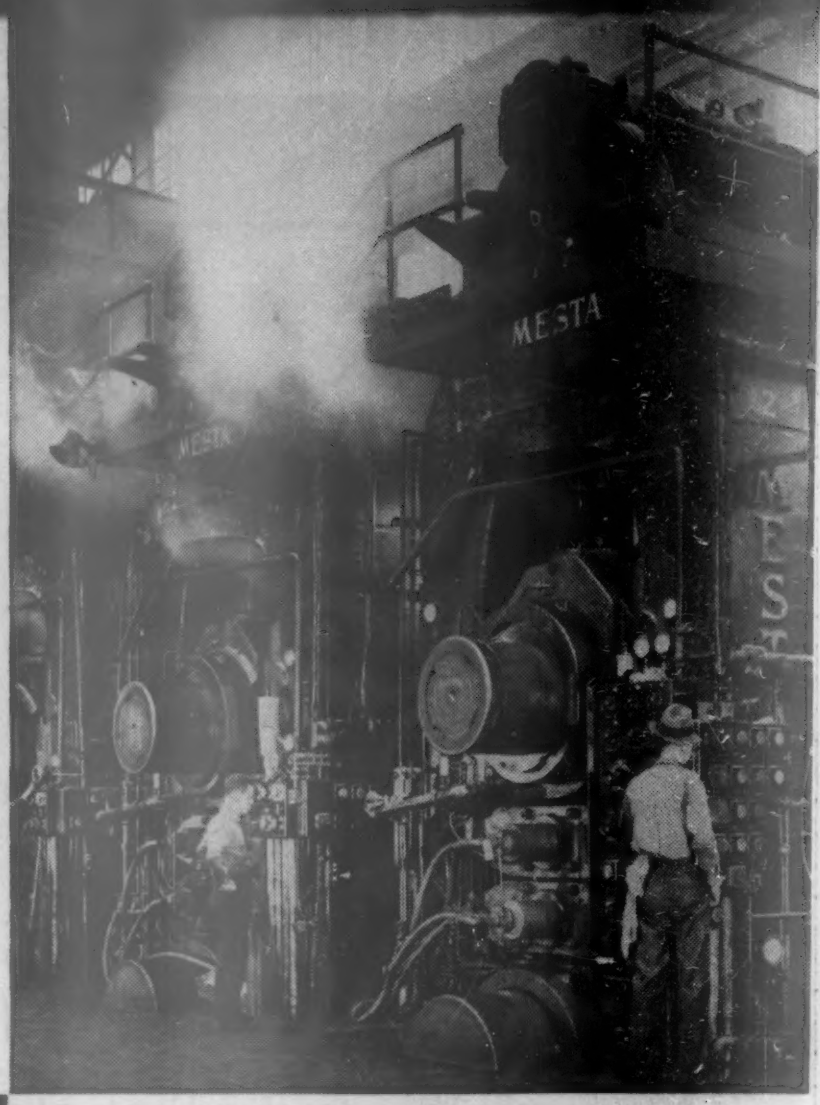

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MOTION STUDY FUNDAMENTALS

CONTINUED FROM PAGE 132

tation means, with load or resistance, from one location to another.

d. *Change direction* (CD). Varying the direction of transportation without a definite stop.

e. *Grasp* (G). Obtaining control of an object.

f. *Hold* (H). Retention of an object after it has been grasped.

g. *Release hold* (RH). Letting go, or relinquishing control of an object.

h. *Position* (P). Placing an object in a desired location.

i. *Pre-position* (PP). Placing an object into approximate position for the next motion to follow.

j. *Select* (St). Searching, finding, or selecting an object.

k. *Plan* (Pn). Delay in performing motions in order to determine a course of action.

l. *Inspect* (I). Examination of an object to determine whether it complies with set standards.

m. *Use* (U). Time required for the operation of a machine, tool, or device.

n. *Assemble* (A). This motion element is seldom employed, since it consists of a combination of other motion elements.

o. *Avoidable delay* (AD). Delay in the operation for which the operator is responsible or over which he has control.

p. *Unavoidable delay* (UD). Delay in the operation outside the operator's control.

q. *Rest for overcoming fatigue* (R). Delay allowed in certain operations to permit the operator to recover from the fatigue of his work.

r. *Balancing delay* (BD). Delay necessary to balance the movements of members of the body.

10. Principles of Motion Study

a. Extensive research by many investigators has developed principles which may be applied to manual operations generally:

b. Provide a chair, adjustable for height, with a backrest and ample seating area, if possible.

c. Arrange the height of the workplace so that alternate sitting and standing at work is possible.

d. Provide double sets of jigs or fixtures wherever possible, to permit the use of both hands.

e. Arrange tools and materials around the workplace as close as possible to the point of use, and pre-positioned in relation to the sequence of motion elements.

f. Locate handles, cranks, and levers in such positions that the worker can operate them with the least change in body position.

g. Avoid holding, use vises or fixtures, freeing the hands to move parts.

h. Provide guides to aid in positioning materials.

i. Provide definite, fixed stations for materials.

j. Make use of momentum and gravity to assist the worker.

k. Use gravity feed containers and bins to deliver the material as close as possible to the point of assembly or use.

l. Confine all motions to the lowest class with which the work can be performed properly.

m. Keep all motion paths within the normal working area.

n. Relieve hands of all work that can be performed by the feet or other parts of the body.

o. A "full-hook" grasp is usually quicker than a "pressure" grasp.

p. It is quicker to move small objects by sliding than by carrying.

q. Where each finger performs some specific movement, distribute the load in accordance with the capacities of the fingers.

r. The two hands should begin and end their motion elements simultaneously.

s. Arm motions should be made simultaneously, in opposite and symmetrical directions.

t. Rhythm is essential to smooth performance, and work should be arranged to encourage natural rhythm.

u. Smooth and continuous curved motions are preferable to those that require sharp changes in direction.

v. Free, loose movements are faster, easier, and more accurate than tense, restricted movements.

w. Ejectors and drop deliveries should be provided to remove finished pieces.

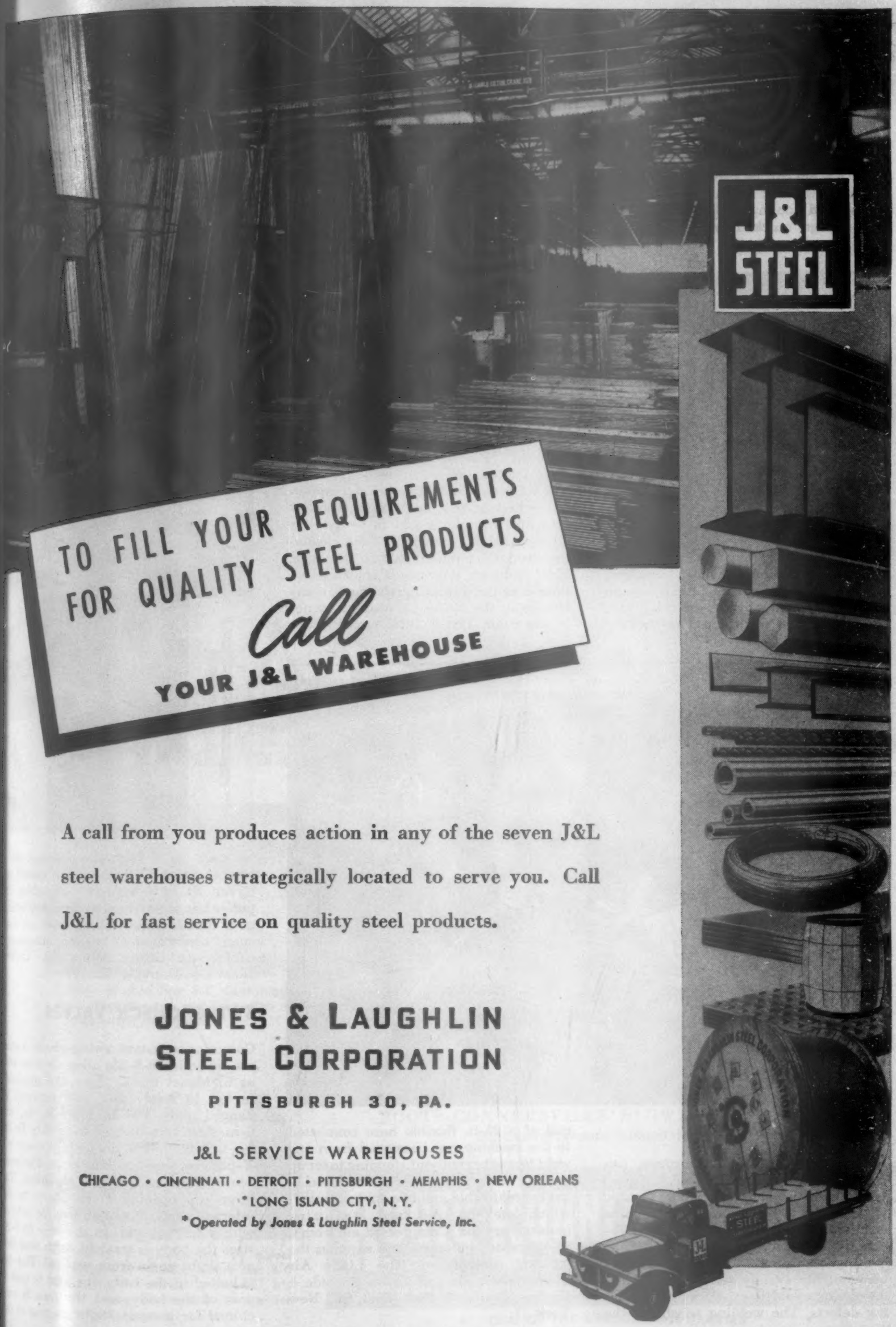
11. Circular Workplace

a. These principles are best applied when a circular workplace is provided for bench operations.

b. In a circular workplace materials are arranged in an arc within normal reach of both arms.

c. Assembly fixtures and drop deliveries are located directly in front of the operator, within a 60-deg. angle of vision, representing 30 degrees each side of the centerline of the operator.

Prepared by Bruno A. Moski, Jr., Plant Manager, The American Paper Goods Company, Kensington, Conn.



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Type AA fan can be used for equalizing temperature and humidity, and for drying and cooling. It is adaptable for cold storage, quick freezing rooms, and

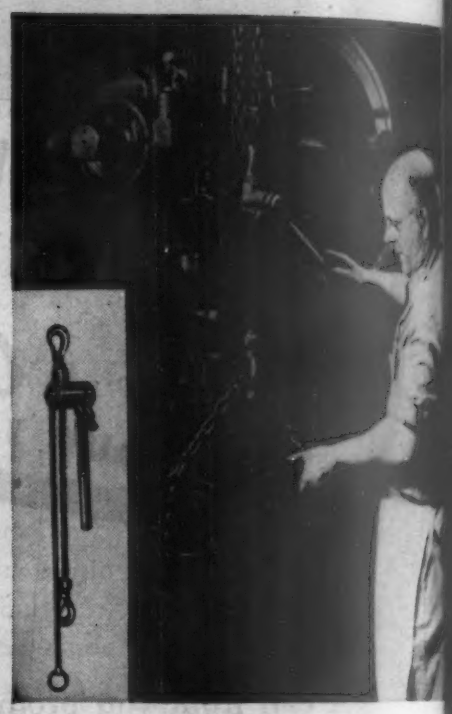
to eliminate dampness by air circulation, as well as for processes that require speed-up cooling by air blast or may need additional warm air. The enclosed motor is equipped with ball bearings for operation in any position. Can be floor-mounted without additional support, or suspended at any angle to direct air flow in a desired direction. Blades are all steel, die stamped and die formed. Fan is equipped with safety guards and an extension cord and plug. The 20-in. fan delivers 3000 c.f.m., and the 24-in. delivers 4800 c.f.m. Chelsea Fan & Blower Co., Inc., 1206 Grove St., Irvington, N. J.

CLEANSING AGENT

Suitable for cleaning hands, walls, porcelain, tile, and other surfaces where dirt, discoloration, and mold must be removed. "Far" removes dirt, grease, grime, paint, and other soiling agents, without water. Including refined lanolin for protecting the hands against chapping, the formula is said to be safe for all users. Maker claims that the cleansing agent will not harden, turn rancid, or form mold on standing open, and that time does not bring liquefaction or any change in the color. Has a mild, neutral odor that disappears after use. Packed in 14-oz., 3-lb., and 5-lb. cans, and in jumbo-sized tubes. Larger containers and dispensers are available. Farbach Chemical Co., Cincinnati 23.

PULLER

Designed to pull or lift 500 pounds, "Mighty Midget" puller has a chain with a tensile yield of 2000 pounds, and snap hooks of 3000 pounds. "Safety load" handle is said to bend at about 800 pounds, a level below the yielding point of any other part of the puller. Weighing 6½ pounds, with chain, the puller features a two-way handle that can



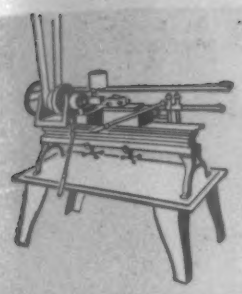
be used as a high-speed crank or ratchet lever. With the chain coiled up it can fit in a toolbox. Portable, the puller has maintenance and construction uses that include pulling wire on long span construction, raising messenger cable, and lifting equipment. Coffing Hoist Co., Danville, Ill.

AUTOMATIC WELDER

Submerged melt welding process can be made available anywhere in the shop with the portable Unionmelt flexible welder. The 900-amp., a.c.-d.c. machine is suitable for making welds that are inaccessible for fully automatic welding, making short welds, building up deposits of almost any size or shape, and depositing metal to repair weld or casting defects. The welding nozzle, at the end of a 20-ft. flexible hose connected to the machine can be moved from one weld to another without stopping to set up guiding equipment. Hose contains welding current cable and two tubes through which welding rod and granular material are fed. Compressed air from a 75-lb. capacity storage tank supplies the welding composition The Linde Air Products Co., Unit of Union Carbide & Carbon Corp., 30 East 42nd St., New York 17.

SWING CHECK VALVES

Corrosion-resistant swing-check valves are made in 18-8 Mo alloy steel as well as in Monel metal. They are available in ½- to 2-in. sizes with screwed or flanged ends, and in 2½-, 3-, 4-, and 6-in. sizes with flanged ends only. In the ½- to 2-in. valves, the body is made in Y-pattern, and the cap is on the same center line as the seat opening. The large cap opening gives access to the internal parts. The disk can be rotated with a screwdriver. In the 2½- to 6-in. sizes the body is straight, with seat face at a slight angle from vertical. The cap is bolted to the body, the seat is cast as part of the body, and the face is machined for pressure-tight seating of the



The first successful turret lathe and the first Roots Blower were built in the same year . . . 1854. We're not good because we're old, but old because we're good.

THE FIRST POUND OF IRON WAS MADE WITH AIR

(Photograph by courtesy of Inland Steel Company, from their motion picture "The Drama of Steel".)

Battery of five big R-C Centrifugal Multi-stage Boosters and Exhausters in a midwestern steel plant.

According to recollection of oldest employees at foundry where this R-C Rotary Positive Blower is installed, it's been giving dependable service for more than 38 years.

For the earliest melting of iron ore, air was supplied by crude, man-power bellows. Today, with a ton of pig iron requiring 2,500 pounds of air, high-capacity, power-driven blowers do the work.

This requires the greatest care in selecting blowers matched to the job. One reason for the frequent specification of Roots-Connersville equipment is our 94-year record for reliable performance.

Another important factor is R-C *dual-ability* to supply either Rotary Positive or Centrifugal units. We are unbiased in our recommendations of whichever type best meets the service demands. Roots-Connersville is the only blower builder giving you this *dual choice.*

For large capacities or for small, built-in applications, as low as 5 CFM, consult R-C *dual-ability* for your blower needs.

ROOTS-CONNERSVILLE BLOWER CORPORATION
802 Central Avenue, Connersville, Indiana

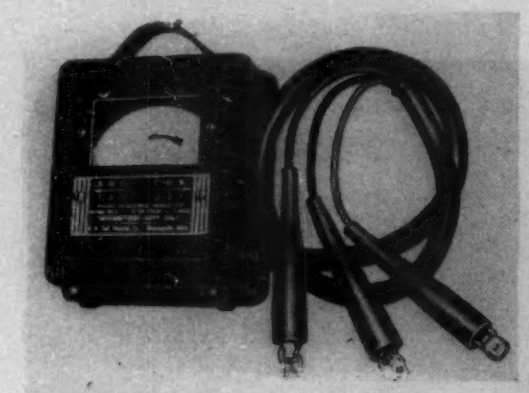
ROOTS-CONNERSVILLE
ROTARY CENTRIFUGAL
BLOWER BUILDERS R-C SINCE 1854
BLOWERS · EXHAUSTERS · BOOSTERS · LIQUID AND VACUUM PUMPS · METERS · INERT GAS GENERATORS

★ ★ ONE OF THE DRESSER INDUSTRIES ★ ★

disk. The check valves are designed for liquid or gas working pressures up to 150 pounds, and for a maximum temperature of 350 deg. F. Crane Co., 836 South Michigan Ave., Chicago 5.

PHASE ROTATION INDICATOR

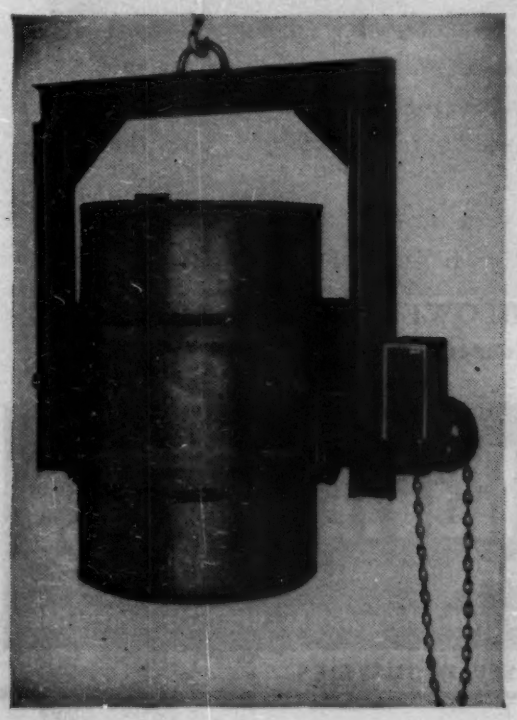
Lightweight, self-contained phase rotation indicator is suitable for "phasing out" new equipment; for re-establishing disrupted service with power of proper phase sequence; for installations of mo-



tors and condensers; for establishing proper starting and running circuit of controllers; and for phasing power outlet where portable equipment is used. Indicates phase sequence as established by the Electrical Engineering Society, by numerical, alphabetical, color coding, and CW-CCW methods. Operating between 50 and 600 volts, 25 to 120 cycles, and on 2-, 3-, or 4-phase circuit, the instrument has a movement consisting of a 4-in. white enamel aluminum disk mounted on a chrome steel shaft supported by two ball bearings. H. H. Sell Electric Co., 1907 Willow Ave. N., Minneapolis 11.

DRUM AND BARREL TILT

Designed to simplify materials handling, and to eliminate hand dumping, a drum and barrel tilt permits controlled dumping of chemicals, liquids, plastics, molding powder, scrap, and glass. The 1000-lb. cap. unit handles standard 55-



gal. drum or barrel. Special sizes or capacities can be built. It is equipped with two safety locking devices to prevent slippage, and permits turning barrel 360 degrees. Turning mechanism incorporates worm drive principle, and is available in hand chain models. Assembly is constructed of heavy structural steel, welded throughout. Palmer-Shile Co., 16007 Fullerton Ave., Detroit 27.

HOSE MOUNTING CLIP

Spring tension of hose mounting clip holds tubing firmly and completely clear of an aperture through which it passes, maker states. Used to support a hose or duct of $2\frac{1}{16}$-in. outside diameter, the clip is made from one continuous piece of

cold drawn music wire about $13\frac{3}{16}$ in. long. It is shaped roughly into a circle which is interrupted at four points to form grippers. The circle secures the duct, and the grippers fit against the edges of the aperture. The design suspends the duct in the center of the aperture without touching the edges, and the tight fit eliminates friction between the clip and the duct. Clip is mounted and demounted by compression of the open ends of the circle. Pepka Spring Co., 810 South Waugh St., Kokomo, Ind.

HAND CLEANER

Waterless hand cleaner, called Miraclene, is a white milky blend of cleaning agents, lanolin, and vegetable oils. Said to cut paint, oil, grease, glues, tar, ditto ink, and carbon paper from the hands. Has an almond odor, contains no grit, and leaves the skin soft, maker states. Comes in 6-oz. and 1-pt. bottles, and in 1- and 5-gal. containers for use in liquid soap dispensers. Miracle Adhesives Corp., 801 Second Ave., New York 17.

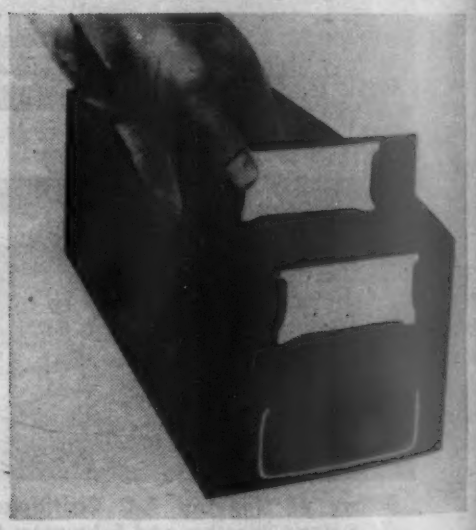
PIPEFITTINGS

Made for brazed pipe joints, malleable pipefittings are threadless, thereby reducing wall thickness and weight. Are claimed to simplify piping layout and make it possible to join steel or wrought iron pipe without threads or welding; permit use of plain end pipe and eliminate the thread cutting that might weaken the pipe wall; provide a joint

as strong as the pipe itself; and have high resistance to vibration. Designed for brazing to standard black steel or wrought-iron pipe, the fittings are made in sizes up to 2 inches. Suitable for 150-lb. working steam pressure at 450 deg. F., or 300 pounds, non-shock, oil, water, or gas lines at 150 deg. F. According to the manufacturer, the interior design of Flagg-Flow, with its unbroken free-flow channels, tends to reduce turbulence because the internal diameter of the fitting is the same as the internal diameter of the pipe. Stanley G. Flagg & Co., Inc., 1423 Chestnut, Philadelphia.

COMPARTMENTED SHELF DRAWERS

Adjustable compartmented shelf drawers are suitable for handling and storing small quantities of small parts. Boxes are slotted on 1-in. centers to



accommodate dividers. Back-stop prevents drawers from dropping accidentally. Drawers may be removed from rack by pulling outward and upward. Label holder is provided on front of box for identifying contents. Box has handle on front. Rack is shipped assembled. Dividers are available. Bay Inc., 1541 West Indiana Ave., Philadelphia 32.

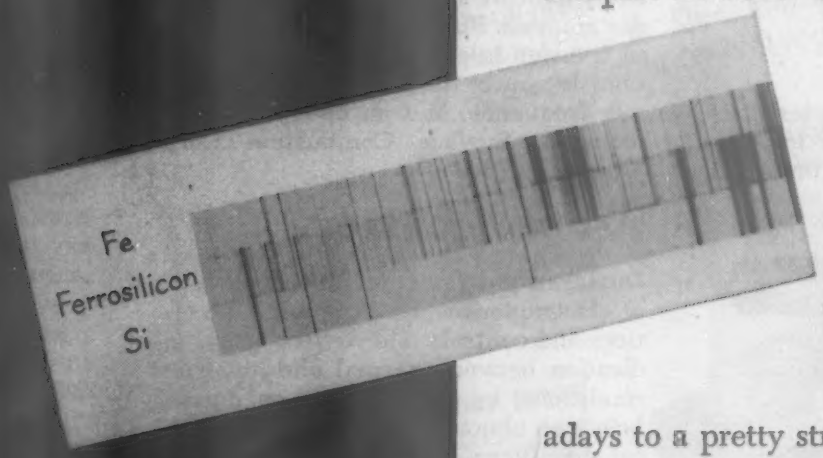
BUTTERFLY VALVE

Three-way valve consists of two butterfly valves and a tee, with the valves interlocked so that the closing of one vane opens the other in any proportion. Low pressure drop and low maintenance are thereby assured, according to the maker. The valve may be lever or hand-

This light slashes your analytical costs

. . . the quickest way to make sure what's in a material is to analyze the light it emits as a hot gas

Spectrochemically, 14 elements can be determined in ferro-silicon at the rate of three samples an hour—a job that takes 100 man-hours per sample by "wet" methods.



That's one of many such reports you can get from industrial managements that have put spectrography to work for low-cost, high-standard quality control of materials they buy or sell.

The technic is down nowadays to a pretty straightforward routine . . .

Your sample can be very small. It may be a little disk of metal that you spark with AC . . . a bit of powder that you put into a carbon arc. The characteristic wavelengths that each element in it contributes to the light produced, are sorted out by the spectrograph which images them on a photographic film or plate. Into your files goes a permanent, compact record of *the elements in your sample, whether expected or not.* Months or years later it is still available to settle questions—objectively.

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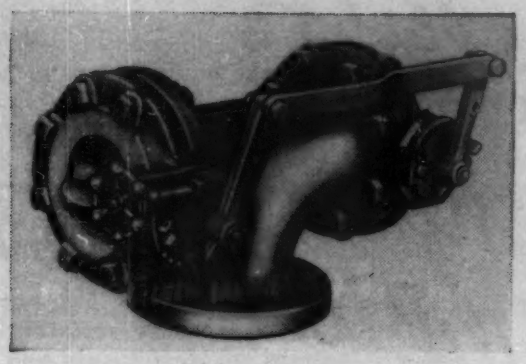
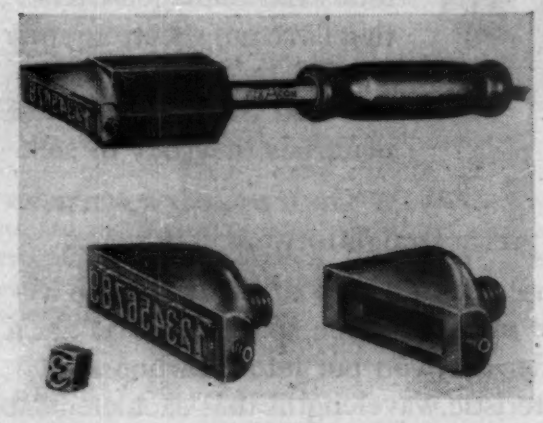


wheel operated. For larger pipe sizes, roller chain and sprocket connections are arranged so that one hand wheel or chain wheel closes one vane while opening the other. Automatic operation can be applied. The valve is designed for quick interchange or diversion of flow or mixing of gases or fluids. Available from 4 to 60 inches, American Standard Pipe Flange Sizes, in cast iron or special alloys. Can be built for pressures to 100 p.s.i., and temperatures to 1,800 deg. F. W. S. Rockwell Co., 200 Eliot St., Fairfield, Conn.

BRANDING IRONS

Line of interchangeable-character electric branding irons is suitable for dating or numbering operations on wood,



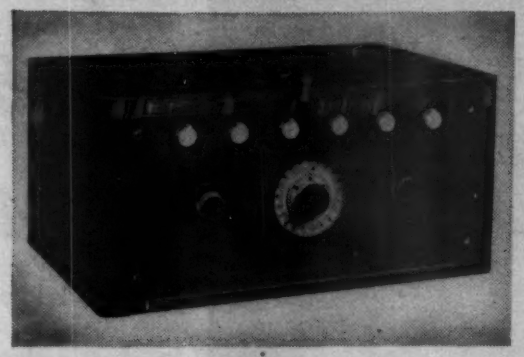
rubber, bakelite, wallboard, plastics, and similar materials. The individual characters can be changed while hot by adjusting a setscrew. There are stock sizes for eight or less removable characters, ¼, ⅜, and ½-inch. in height, but it can be furnished for other characters and heights, or a combination of permanent and removable characters. Operates from 110 or 220-volt circuit, a.c. or d.c., any cycle. Equipped with 6-ft. cord and plug. The Hexacon Electric Co., 105 West Clay Ave., Roselle Park, N. J.

FIRE-RESISTANT PANELING

Human flesh, within 1 inch of 2200-deg. F. fire, is claimed to be protected by Pyroply paneling. Made of treated Du-Pont "Strux" cellular cellulose acetate plastic sandwiched between sheets of 0.006-in. carbon steel, the panels weigh less than a pound per square foot, and can support the weight of a large man, according to the manufacturer. The paneling is said to stand up after more than an hour of exposure to a 2000-deg. F. flame. The panels also insulate against noise. Skydyne Corp., Port Jervis, N. Y.

ATMOSPHERE SELECTOR

Selector for atmosphere gases enables manufacturer's dewpoint recorder to analyze consecutively atmospheres from



six different sources in timed sequence. The atmosphere selector consists primarily of a 6-way valve, motor, and electric time clock. At a pre-set time the source of atmosphere supply to the recorder is automatically switched from one line to the next. Numbered pilot lamps on the control panel of the machine indicate source of atmosphere under analysis. Pushbutton on panel serves to transfer inlet valve to the next station or source line. Large control dial sets frequency, and an *on-off* switch is included. Surface Combustion Corp., Toledo 1, Ohio.

ELECTRIC CONTROL

Dualarms provide automatic supervision of electric loads, and of operating practices and controls. They effect visual indication between normal and abnormal conditions, by glowing *dim* on normal, *bright* on abnormal, and *flasher* on critical conditions. A howler or siren may be connected in circuit where audible signals are required. Thermal relay, called Pilotrol, is installed in series with power loads, plugged-in (as standard fuses) in line feeder circuits. They are

available in sizes ranging from fracti to 250 horsepower, a.c. and d.c. control contains other relays, condens resistors, and rectifying compone connected to provide various g effects in the signal lamp. The alar are also provided with an interrupt control circuit indicator. Pilotron Co. America, 3774 Surf Ave., Brooklyn

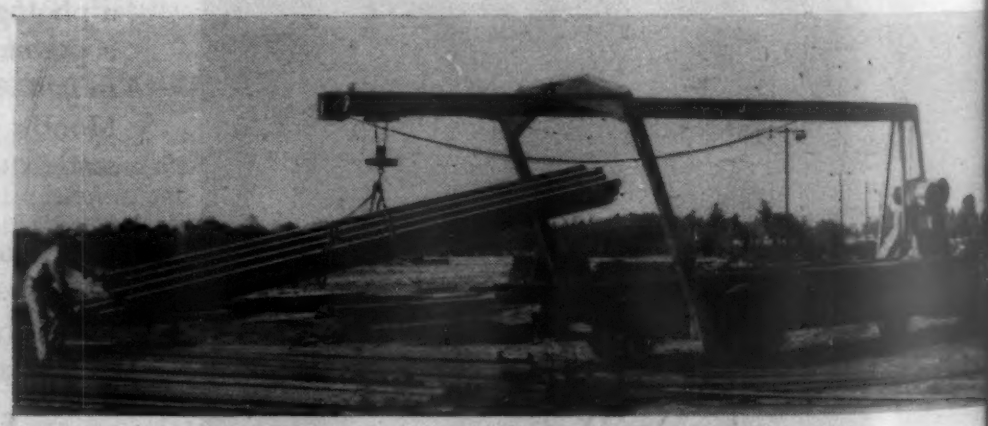
MAGNETIC SEPARATOR

Non-electric magnetic plate, for removal of tramp iron from wet a dry solids, requires no wires, rectifi

battery, or generator. Installation equipment protects processing machi ery from damage from metal trash; stallation ahead of packaging machine prevents contamination by iron or st particles. Plate is said to hold magneti for 10 years. Columbia Eng. Service C 593 Market St., San Francisco.

CARBON ARC TORCH

Flexarc carbon arc torch is suitable brazing, soldering, and supplying h for light forging, preheating bef welding, and tempering operations. F



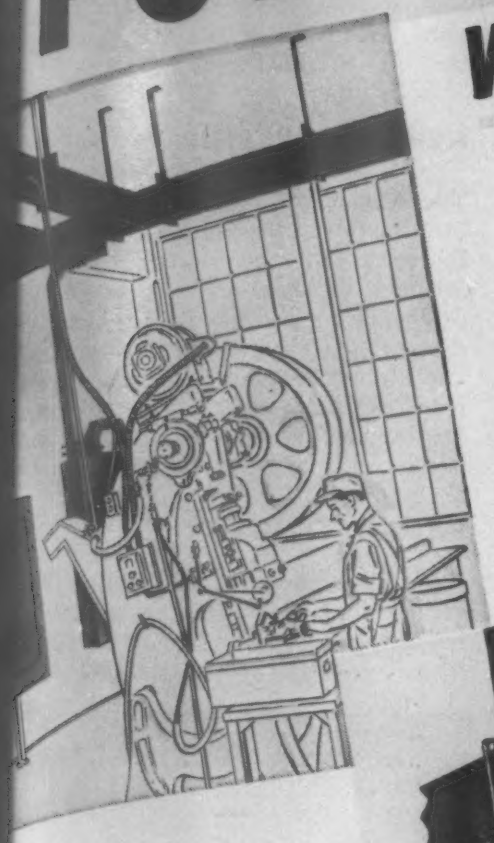
HEAVY-DUTY HAULER

Built for on-road or off-road hauling, heavy-duty electrically powered Tournahauler, mounted on large rubber tires, is said to have the power and traction to negotiate almost any type of rough going, with loads ranging from 20 to 100 tons. It is engineered for long as well as short hauls. Increased traction is claimed through the Tournamatic differential, which causes the drive wheel having the greatest traction to pull s eral times harder than the other. Ste ing power is controlled by s micro-switches on the dashboard. two-wheeled prime mover is dies powered with electric starter. It equipped with multiple disk air-ac ated brakes. Design permits 90-d turns. Overhead trolleys, winches, or cranes with electric-powered cable ho may be installed. R. G. LeTourne Inc., Longview, Tex.

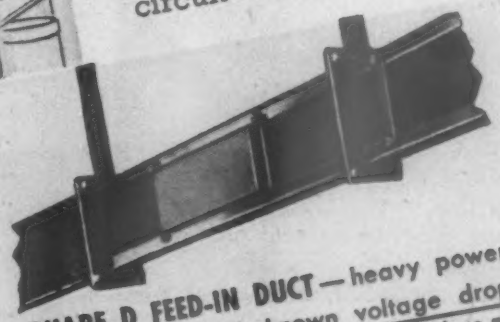
POWER YOU NEED...

Where you need it

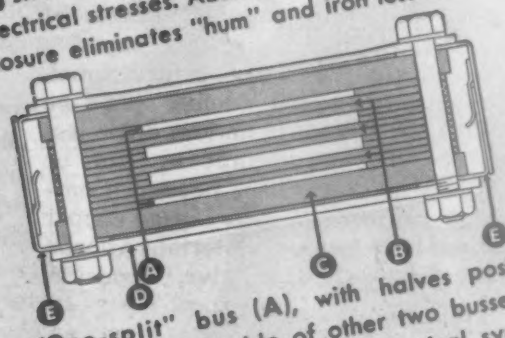
When you need it



• Electrical power is becoming more and more important in modern production methods. It's needed in larger amounts at many and varying locations dependent upon shop layout and machine arrangement. Square D's Feed-in and Plug-in Duct are a combination with an outstanding performance record in hundreds of plants throughout the country. Feed-in Duct handles heavy loads characteristic of large feeder circuits with high efficiency and low voltage drop. Plug-in Duct permits protected branch circuit "take-offs" at frequent intervals along the length of the duct.



SQUARE D FEED-IN DUCT—heavy power feeder with lowest known voltage drop characteristics. Exclusive design requires no ventilation for limiting temperature rise—permits completely enclosed, dust-excluding structure. Rigid construction resists heavy electrical stresses. Absence of all-metal enclosure eliminates "hum" and iron losses.



"One-split" bus (A), with halves positioned on either side of other two busses, permits close spacing and electrical symmetry important to reduction of both energy loss and voltage drop.

Solid ebonized asbestos insulating plates (B) and (C) which totally enclose bus, have great mechanical and high dielectric strength, conduct heat readily, are impervious to moisture and resistant to arc. Surge clamps (D) every 24" give structural and mechanical strength necessary to withstand 50,000 ampere "shorts." Steel channels (E) complete the housing.

SQUARE D PLUG-IN DUCT—for flexible power distribution to branch circuits. Round bus bars provide greater mechanical strength and resistance to short circuit stresses. Steel enclosure and rotating doors over plug-in openings exclude dust and dirt.

Plug-in units are easily attached. Powerful contact jaws, affording positive pressure, can be "rocked" into position on bus bars. Five units may be attached to either side of each ten-foot section. Flexible couplings join Plug-in bus bars—absorb expansion or contraction and eliminate section alignment problems.

A quick glance tells you what Square D Feed-in and Plug-in Duct do. It takes a closer look to learn how they do it and why they do it better. Your nearby Square D Field Engineer will be glad to give you the complete story. Or write for detailed information.

Address: **Square D Company, 6060 Rivard St., Detroit 11, Michigan.**

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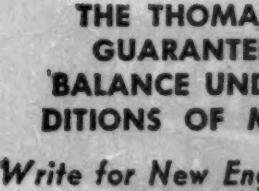
Engineered to stand up on the toughest jobs, Thomas Flexible Couplings do not depend on springs, gears, rubber or grids to drive. All power is transmitted by direct pull.



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BACKLASH FRICTION WEAR and CROSS-PULL are eliminated NO LUBRICATION REQUIRED!

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THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT

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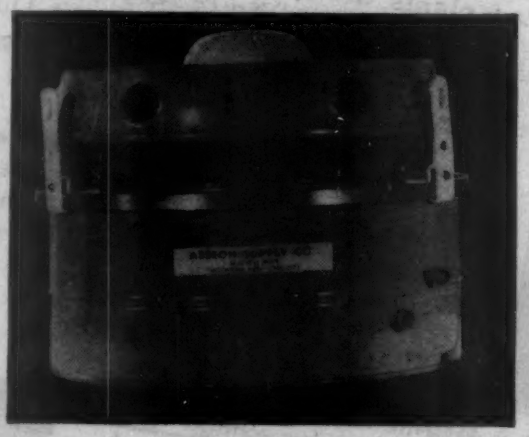
WARREN, PENNSYLVANIA

nished with two 10-ft. extra flexible welding cable leads attached; one pair ¼x6-in. carbon electrodes; and one pair ⅜x6-in. carbon electrodes. Leads are equipped with bayonet attachment plugs to fit WT Midget Marvel and Limited Input welders. Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30.

HUMIDIFIER

Requiring no steam, pumps, or compressors, industrial humidifier is said to be noiseless in operation, and to atomize moisture in a fine vapor form. The lower



pan is covered, and the air is brought in from the bottom through a fiberglass filter. Equipped with brackets, the unit is hung from the ceiling, and connected to a single water pipe. No return waterline is needed. Automatic controls are supplied for regulating percentages of relative humidity. Vaporizing capacity is over 1 g.p.h. A 360-deg., 2-directional, or single-directional dome can be supplied. Ball-bearing motors draw less than 100 watts per unit or can be furnished for d.c. where needed. Components are made of heavy-gage copper or other non-ferrous material. Abbeon Supply Co., 58-10 41st Drive, Woodside, N. Y.

MANUAL REMOTE CONTROLS

Absolute manual remote control of mechanical, hydraulic, or other equipment is said to be provided by line of push-pull controls. Three types are available —light-duty, ⅜-in. O.D. rigid housing, has load range to 1250 pounds ultimate

compression; heavy-duty—7/16-in. O.D. rigid housing, has load range to 1650 pounds; and extra-heavy-duty—½-in. O.D. rigid housing, has load range to 3050 pounds. Moving element is made up with flexible tinned aircraft cable over which a series of steel or stainless steel spherical shells are strung. Standard *O* rings seal both ends. Housings are 24 S.T. or 52 S.O. aluminum; all other aluminum parts are 24 S.T. Dural. Stainless steel control parts are available. Southwest Products Co., 10 South Catalina St., Pasadena 1, Calif.

NEW OWNERSHIP

The Capacitron Co., Inc., Chicago, has been acquired by Jefferson Electric Co., Bellwood, Ill., manufacturers of transformers, ballasts, and fuses. Capacitron produces oil-filled and electrolytic condensers, a.c. motor-starting capacitors, and Ballastrons, a type of condenser that provides high-power-factor correction for low-power-factor fluorescent lamp ballasts.

PALLET TRUCK

Hydraulic-operated hand pallet truck, called Jack-O-Might, having 2000-lb. capacity, is operated by a hydraulic jack unit, said to be tested to 10,000 pounds

static capacity. According to the manufacturer, the unit can be replaced with a spare in five minutes. Two of the four wheels swivel 360 degrees, permitting the truck to be maneuvered in close quarters. Wheels are equipped with Hyatt roller bearings. Weighing 175 pounds, the truck handles all standard pallets, and has a 2½-in. lift. Sherman Industries, Div. of Sallinger-Sherman, Inc., 138 Brookline Ave., Boston 15.

POWDERED SOAP DISPENSER

No ratchets, gears, or mechanical agitators are used in Powdurn, a powdered soap dispenser. The container rocks back and forth, shaking powder into the hand that operates the dispenser. Caking of powder is avoided, because moisture does not enter the container. Dispenser cannot be removed from a wall when the cover is locked. The one-hand-operated unit delivers a measured amount of powdered soap. Knob and discharge mechanism are made of stain-

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for GUARANTEED PERFORMANCE

From the largest **FINISHING SYSTEMS**

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- SPRAY BOOTHS
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and allied equipment. Installed as complete system or in separate units.

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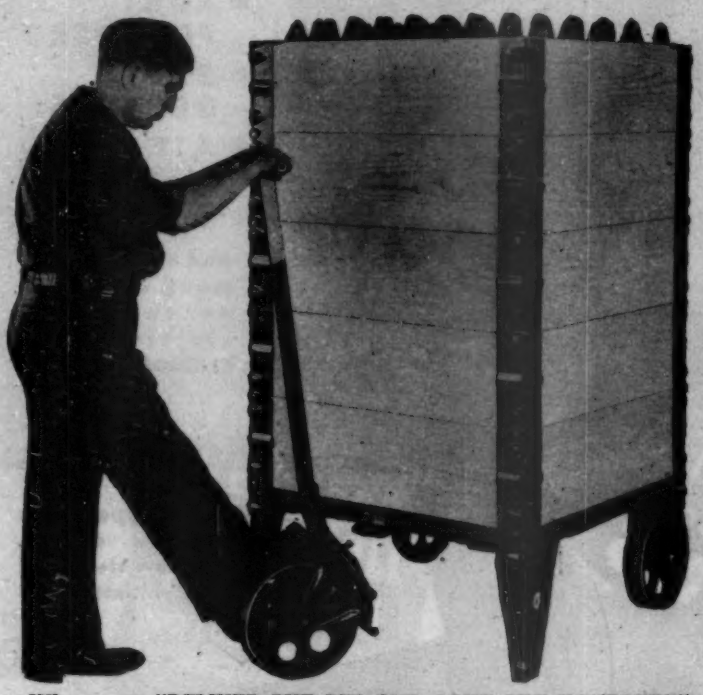
This Valuable *Free* IDEA BOOK

tells you how to

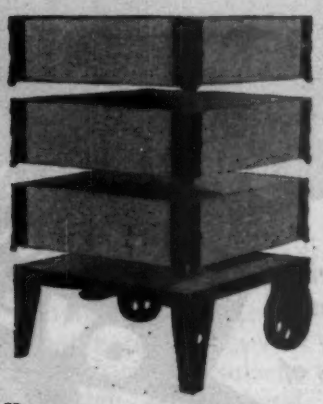
SAVE 50% FLOOR SPACE LABOR COST EQUIPMENT COST

with

THE TURNER SYSTEM OF MATERIALS HANDLING



Just off the press and full of new ideas on reducing handling costs, the TURNER SYSTEM BOOK shows the way to greater profit . . . describes a plan for cutting labor, handling, and storage expense, speeding production, reducing accidents . . . in almost any size plant. The book is sent without charge.



When you "DELIVER THE BIN AND SAVE THE HANDLING" you get up to 80% saving on the handling of small parts. Wooden-side or All-steel Bin Sections, Racks, Trays and Die Tables fit on the Turner Transport which is moved by hand Jimmy, power lift truck, crane or tractor.

Have you ever figured the time wasted when employees must reach down to bottom of over-size bin? Turner Bin Sections are removed as load diminishes, added as load increases.

Save Time, Labor and Space with Die Racks on Wheels

Turner System Die Racks mounted on Transports are moved quickly without waiting for lift trucks. These racks protect valuable dies, insure orderly storage and enable prompt handling. Six styles and sizes described in the Turner System Book.

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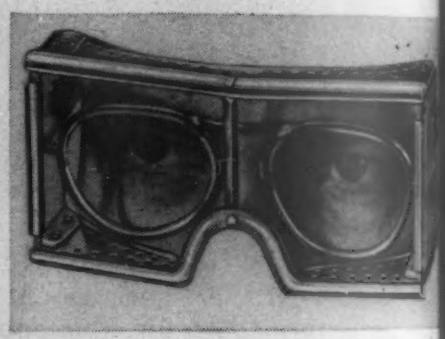
FACTORY SERVICE COMPANY

4605 N. TWENTY-FIRST STREET MILWAUKEE 9, WISCONSIN

less steel; cover and container are c brass, chromium plated. Unit has sep arate wall plate to facilitate installation American Dispenser Co., Inc., 215 Fourt Ave., New York 3.

SAFETY GOGGLES

Model 30 lightweight Eye Savers fit ove glasses and wide safety spectacles. Th molded frame and shatter-resistant Im



pax plastic lenses are said to withstan heavy impact. Large bridge provide universal fit. They protect prescriptio glasses from scratches or breakag Frame or lenses can be replace Watchemoket Optical Co., Providence

WOOD MAUL

Cross-bolted aluminum alloy eye join the head and handle of the Metalocke wood maul to prevent breakage and re duce danger of the head flying off. Hol the head rigid, and prevents it fro shifting. Heads are replaceable. Th wood head allows use of the maul f striking machinery or metal where ste mallets might cause damage. The to

Six Workers + E-M Foresight = Five Heroes

Employers Mutuals
Job Safety Training seemed "dull stuff" until the moment of tense drama came . . .

All six men of the power-line crew had received Employers Mutuals safety training...wondered whether such "dull routine stuff" was necessary, until one day—

A severe electric shock hurtled one of their number from a pole, his clothing aflame. His five mates, ready for such emergency, quickly beat out the flames, loosened his clothing, induced artificial respiration, had him well on the way to recovery within a half hour.

Each received a gold watch from Employers Mutuals in recognition of his part in saving a fellow worker's life.

Throughout industry, in every type of business, thousands of men and women are taught such life-saving practices, trained how to act in an emergency by Employers Mutuals engineers and industrial nurses.

Skill in accident prevention, control of industrial health hazards, development of first aid programs . . . all are accomplished with a tactful, human approach that builds good will and makes Employers Mutuals services unique in the insurance field.

Employers Mutuals write: Workmen's Compensation—Public Liability—Automobile—Group Health and Accident—Burglary—Plate Glass—Fidelity Bonds—and other casualty insurance. Fire—Extended Coverage—Inland Marine—and allied lines. All policies are nonassessable.

Your plant accident experience materially affects the cost of your workmen's compensation insurance. Send for Employers Mutuals' booklet, "Safety Engineering." It explains the importance of such facilities and experience in keeping your accidents under control. Also be sure to have our "Dictionary of Insurance Terms." It will help you to understand the provisions of your policies. Send for these valuable, informative booklets on your letterhead—or call your local Employers Mutuals man.

Employers Mutuals Policies Protect Lives, Health and Property

EMPLOYERS MUTUALS OF WAUSAU

. . . make insurance understandable

Saving $15 by Spending $1 for McCASKEY TOOL CONTROL

Three manufacturers recently completed thorough studies of the savings to be made in their plants through the use of a modern tool checking system. The results amazed them!

One plant operates several tool cribs. Their engineers reported that an investment of about $5,000 will save $73,000 the first year of operation. They recommended McCaskey Tool Crib Control.

The engineers of the second plant reported annual purchases of small tools and possible savings that opened the eyes of their management. They recommended McCaskey Tool Control for three cribs.

Savings of $65,000 on a tool investment of $500,000 were reported in the third plant. The engineers again recommended McCaskey Tool Crib Control to do the job.

Each of these plants has a world-wide reputation for alert production management. They have invested millions in modern production equipment but overlooked economies from adequate control of tools.

Facts from the results of numerous users prove that large savings can be made in practically every plant loaning tools to employees. They represent widely varying requirements . . . . plants employing from as few as 50 or 75 to fifty thousand or more and operating one or many tool cribs.

Let us have a representative explain how McCaskey will pay its way from the beginning in your plant . . . . or send you proof of savings in several well-known plants.

McCaskey INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

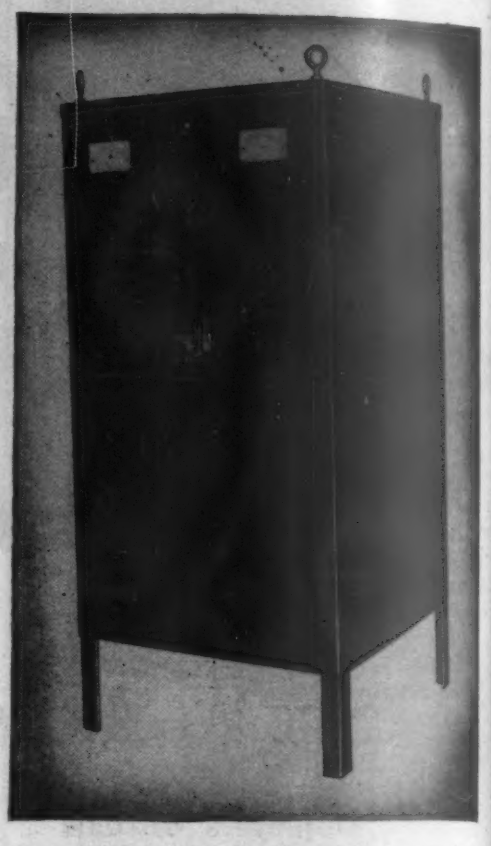
THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada — The McCaskey Register Co., Watford, England

is made in three sizes: heavy-duty Model A, 36 inches long, with 11½x2¾-in. head, weighing 6½ pounds; Model B, 18 inches long, head 7x1¼ inches, weight 1¾ pounds; and Model C, 17½ inches, head 6½x1¼ inches, weight 1½ pounds. Safety First Supply Co., 530 Fernando St., Pittsburgh 19.

D.C. RECTIFIER

Low-voltage, high-current rectifiers operate from 220 or 440 volts, 3-phase, a.c. power lines. D.c. output voltage can be

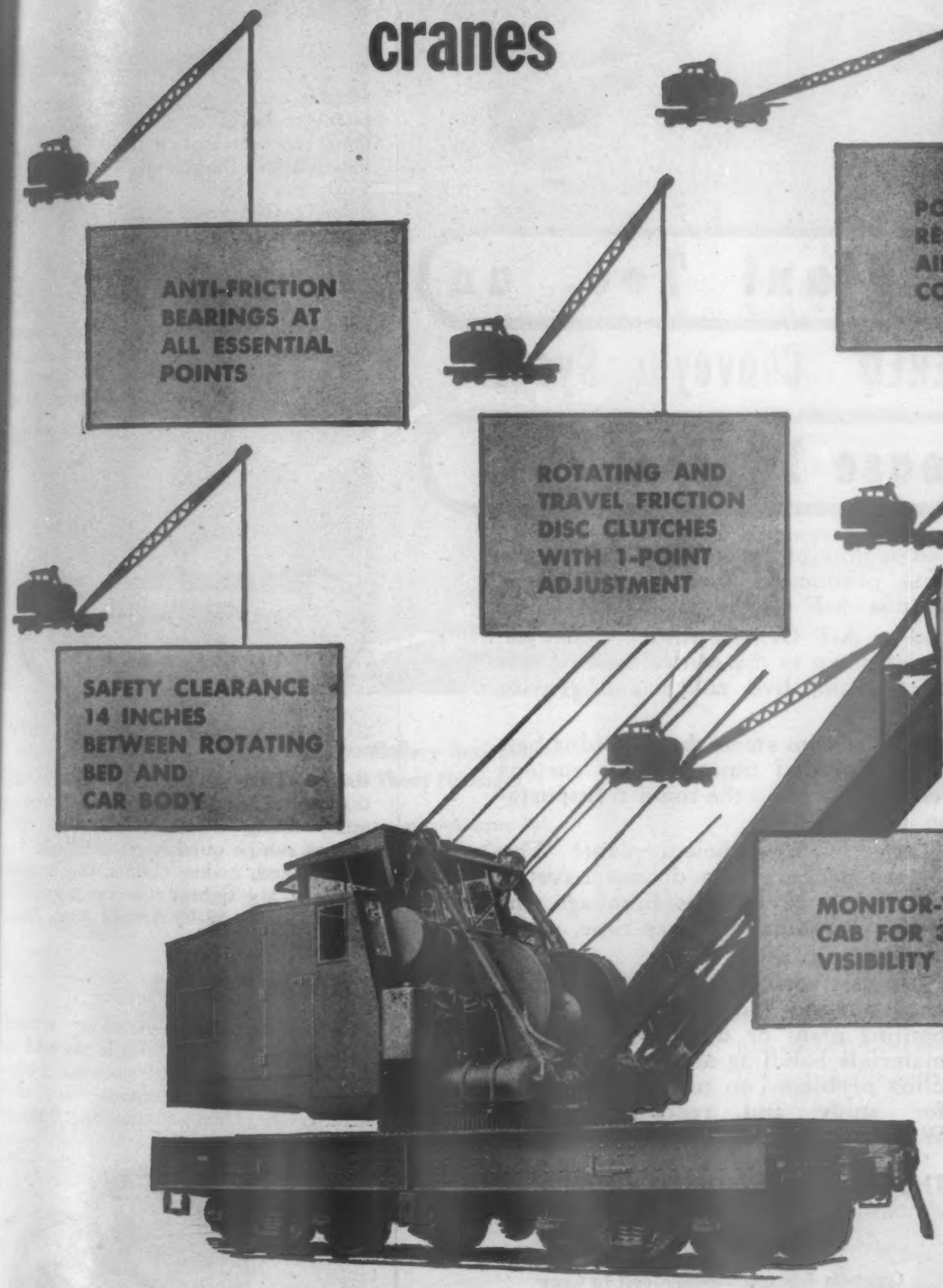


varied from 0 to 6 volts with a capacity of 600 amperes, or from 0 to 12 volts with a capacity of 300 amperes. Although intended for use in electroplating and electrolytic cleaning, the rectifiers provide a source of power for production testing, and running in, of 6- and 12-volt d.c. motors. The units feature sealed selenium rectifier elements; heavy-duty variable voltage transformer providing stepless control over output voltages; large 4½-in. ammeter and voltmeter; and protection against overloads and failure of ventilation system. Mellaphone Electronic Rectifier Co., Inc., Rochester 2, N. Y.

HUMIDITY INDICATOR

Electric-motor-driven humidity measuring instrument includes thermometers reading to ⅕ degree, and psychrometric chart. Uses matched wet and dry bulb thermometers with scale readings from 40 to 120 deg. F. The chart facilitates translating the wet and dry temperature readings into precise relative humidity percentages. Called an aspirating psychrometer, the device can be used as a standard check for other humidity instruments, for constant temperature rooms, for spot checks, and other applications. In addition to the chart, the unit includes a wick, thread, scissors, a bottle of distilled water, and carrying case. An

LIFT your material handling efficiency...
LOWER your operating costs with
BROWNHOIST locomotive
cranes

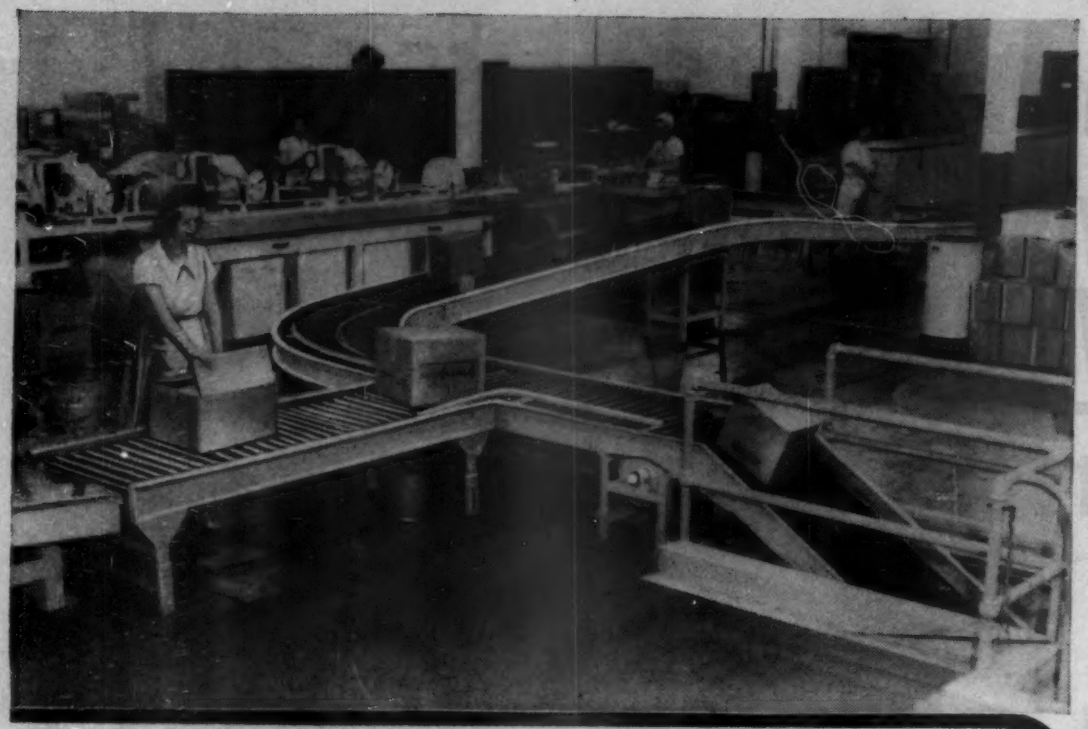

ANTI-FRICTION BEARINGS AT ALL ESSENTIAL POINTS
POSITIVE RESPONSE TO AIR-OPERATED CONTROLS
ROTATING AND TRAVEL FRICTION DISC CLUTCHES WITH 1-POINT ADJUSTMENT
ONE PIECE CAST STEEL BED
SAFETY CLEARANCE 14 INCHES BETWEEN ROTATING BED AND CAR BODY
MONITOR-TYPE CAB FOR 360° VISIBILITY

BROWNHOIST BUILDS BETTER CRANES

Write for further information

INDUSTRIAL BROWNHOIST CORPORATION • BAY CITY, MICHIGAN

DISTRICT OFFICES: NEW YORK, PHILADELPHIA, CLEVELAND, CHICAGO • AGENCIES: DETROIT, BIRMINGHAM, HOUSTON, LOS ANGELES, PORTLAND, SAN FRANCISCO, SEATTLE, SPOKANE, CANADIAN BROWNHOIST LTD., MONTREAL, QUEBEC.



In YOUR Plant Too, an A-F "ENGINEERED" Conveyor System Will Increase EFFICIENCY!

★ From the filling and sealing of cartons and cases . . . to storage and shipping, production flows in an endless stream—because of this A-F Conveying System.

Cartons are filled *on* A-F Gravity Roller Conveyor Sections and conveyed down to the central sealing station to accumulate on the live roller and gravity conveyor.

An automatic timing system starts the declining belt at a pre-determined scheduled time and the cartons travel down the decline to join in the main transportation system on the floor below.

No fetch and carry in *this* efficient plant! The work is brought *to* the packers who do not have to lift or move. This procedure reduces breakage, increases production, saves time, saves money.

If *you* wish to increase the efficiency of your factory, mill, brewery, bottling plant or distillery, put *your* materials handling and products handling problems up to A-F Engineers for study and recommendations. Write today . . .

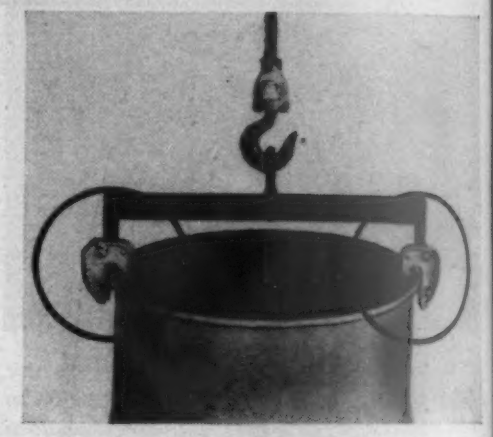
THE ALVEY-FERGUSON COMPANY
122 Disney St., Established 1901, Cincinnati 9, Ohio
Export Department, Cable Address "Conveyor"
Offices In Principal Cities—Coast To Coast

CONVEYING EQUIPMENT
Alvey-Ferguson
METAL PRODUCTS CLEANING EQUIPMENT

adapter can be supplied over the thermometer bulbs of the matched thermometers so that a tube could be inserted in an enclosure, such as ductwork, to obtain humidity readings. Minneapolis-Honeywell Regulator Co., 2709 Fourth Ave. S., Minneapolis 8.

BARREL LIFTER

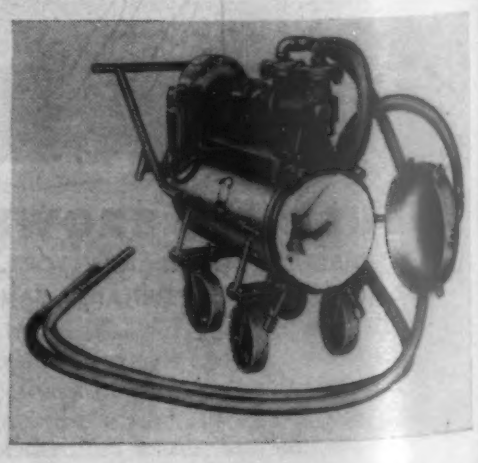
Dual clamp, for lifting barrels, consists of a cross arm of the width of the standard barrel, with a Volz clamp attached to both ends of the arm. The center of

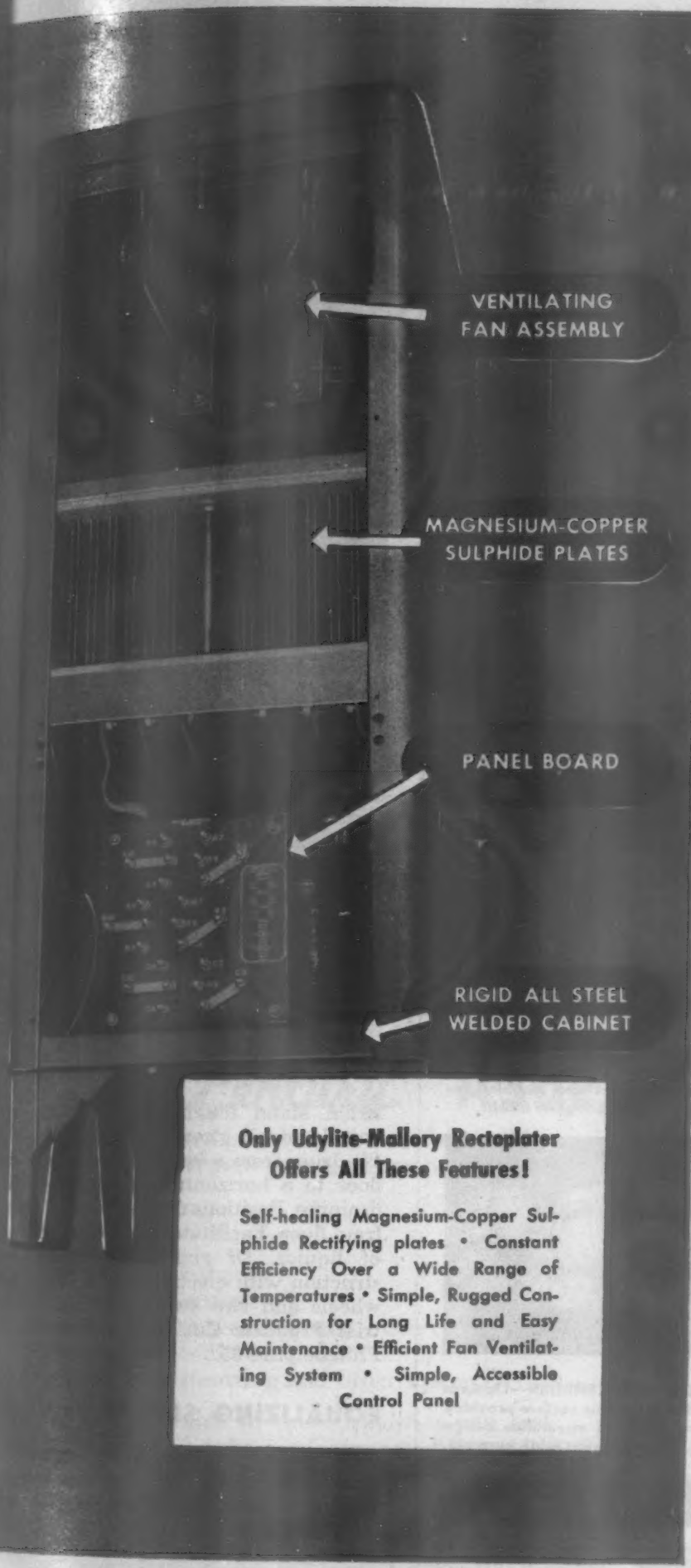


the cross bar is provided with a ring through which the hook of the hoist or other lifting media is attached. The clamps can be quickly attached and detached, and, maker claims, the heavier the load, the tighter the clamp grips it. Merrill Bros., 56-02 Arnold Ave., Maspeth, N. Y.

COOLANT FILTER

Mounted on four 8-in. caster wheels, machine tool coolant filter is powered by its own motor and vacuum pump. Operates on a continuous circulation arrangement from a suction hose through





Only Udylite-Mallory Rectoplater Offers All These Features!

Self-healing Magnesium-Copper Sulphide Rectifying plates • Constant Efficiency Over a Wide Range of Temperatures • Simple, Rugged Construction for Long Life and Easy Maintenance • Efficient Fan Ventilating System • Simple, Accessible Control Panel

THE INSIDE STORY OF RECTOPLATER PERFORMANCE

Best gauge of rectifier performance in a plating shop is how well it operates day in and day out, on a wide variety of assignments, with a minimum of trouble, risk and attention.

This calls for a rugged, dependable unit—and that's just what Udylite-Mallory Rectoplater is. That's one reason why 8,000 of these units have been produced—more than the combined total of all competitive makes!

Heart of the Rectoplater is the self-healing Magnesium-Copper Sulphide plates. They have three characteristics of top importance:

1. Because they are self-healing they are not subject to overload damage caused by current surges.
2. They operate effectively over a wide range of temperatures.
3. Their efficiency is constant and does not diminish with use.

Add to these the rugged all-metal construction of Rectoplater — the efficient fan ventilating system—the accessible, simple panel board—it all adds up to real plating shop performance.

Here is one more place where Udylite excels—a Udylite Technical Man will gladly show you many other ways Udylite can make your business more profitable. Write Udylite Corporation, Detroit 11, Michigan. Offices in Principal Cities.

PIONEER OF A BETTER WAY IN PLATING . . .

TESTED SOLUTIONS • TAILORED EQUIPMENT

AUTOMATIC CONTROL FOR METAL FINISHING

THE Udylite CORPORATION

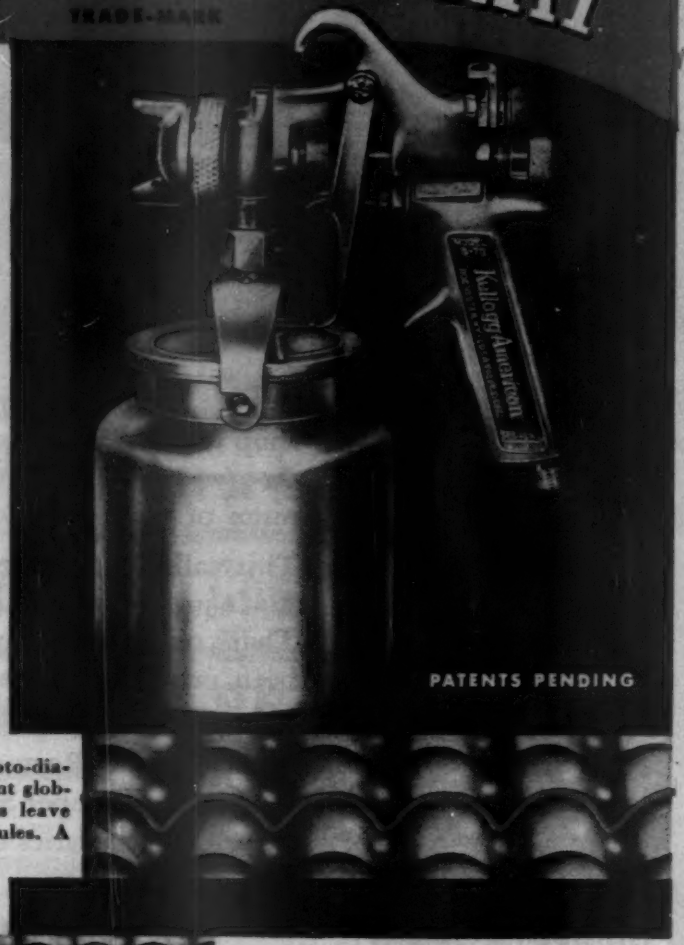
NEW Brake Shoe MICRO-SPRAY

TRADE-MARK

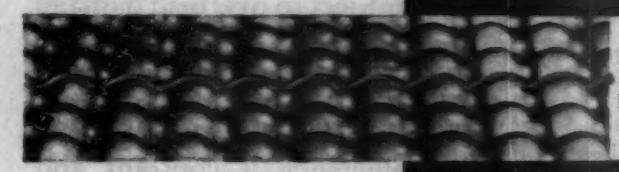
14 EXCLUSIVE ENGINEERED EXTRAS Give You

FINER ATOMIZATION

MORE EVEN DISTRIBUTION



ORDINARY SPRAY GUN ATOMIZATION—Photo-diagram of greatly magnified sprayed paint globules show how large paint globules leave deeper, visible valleys between globules. A wavy, low-gloss finish results.



Brake Shoe MICRO-SPRAY ATOMIZATION — Finer, microscopic paint globules leave much shallower, invisible valleys between globules, resulting in a smoother, higher-gloss finish.

ORDINARY SPRAY GUN DISTRIBUTION—Paint globules pile up in some areas and thin out in others due to irregular air stream.

Brake Shoe MICRO-SPRAY DISTRIBUTION—Uniform flow of paint globules to the surface provided by uniform precision and streamline design of air passages, which prevent eddy currents.

SAVES TIME, SAVES AIR, SAVES PAINT, SAVES MONEY, TOO

American Brake Shoe Company, Kellogg Division FM-4
Rochester 9, New York
Please send me complete information on the NEW Brake Shoe MICRO-SPRAY Gun.

NAME_____

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A PRODUCT OF

AMERICAN Brake Shoe COMPANY

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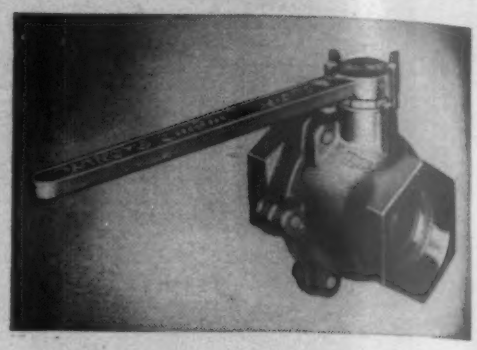
KELLOGG DIVISION

the filter tank and discharge hose. Flow rate is 12 g.p.m. Abrasives do not enter the pump. Filtering medium is a removable close-woven cloth bag in a perforated metal basket. Lid is self-locking. The entire unit will tilt at 45-deg. angle on back wheels and auxiliary legs to facilitate emptying. Filter bag can be washed in a degreaser and reused. Honan-Crane Corp., 702 Wabash Ave., Lebanon, Ind.

BALL-TYPE VALVE

Preventing turbulence in the fluid stream, valve has full round port area which does not permit the shape of the stream to change. It is constructed with



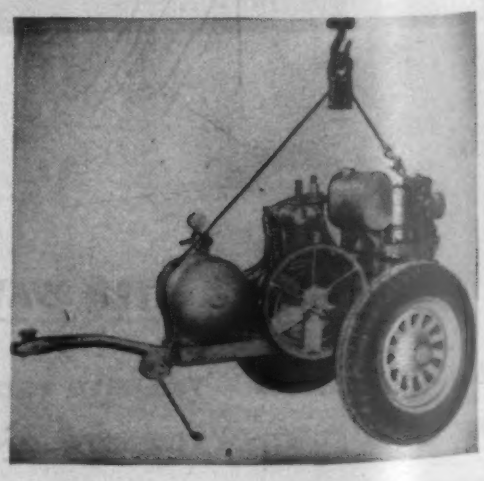
a floating bronze ball that is hard-chrome plated. The ball in combination with the resilient synthetic rubber seat, allows abrasive particles, when valve is opened or closed, to be wiped clear of the seating surface automatically, without injury to ball or seat. Made in bronze, with screwed ends in all pipe sizes from ½ to 2 inches for 150 p.s.i. working pressure. Rockwood Sprinkler Co., 38 Harlow St., Worcester 5, Mass.

DRUM AND BARREL RACK

Drain stand for handling drums and barrels of all sizes allows one man to tilt drum from a vertical position on the floor to a horizontal elevated level for draining. Positions drum spigot 18 inches from floor. Facilitates complete drainage of liquids. Of rigid angle iron construction with electric welds, it has two wheels and two swivel casters. Industrial Products Co., 2809 North 4th St., Philadelphia 33.

EQUALIZING SLINGS

Redesigned Adjust-A-Leg equalizing sling is available in capacities ranging from ¾ to 12 tons, with a safety factor of



K&M "Century" ASBESTOS CORRUGATED

What will determine the choice of building materials for your new plant, or remodeling job?

Will it be—

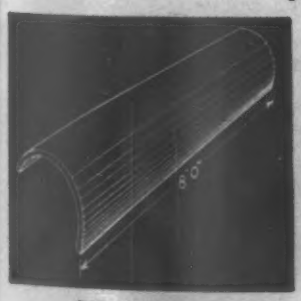
Appearance?
First cost?
Construction economy?
Speed of application?
Resistance to fire, weather, rust, other conditions?
Strength, durability?
Freedom from painting and other upkeep?

Regardless of which of those qualities you seek, K&M "Century" Asbestos Corrugated is an ideal choice, for it incorporates *all* of them in every rugged sheet. Being made of indestructible asbestos and Portland cement, it can't burn, can't rot, can't rust. Considering these many advantages, its cost is moderate, and it will pay for itself many times over in long maintenance-free life.

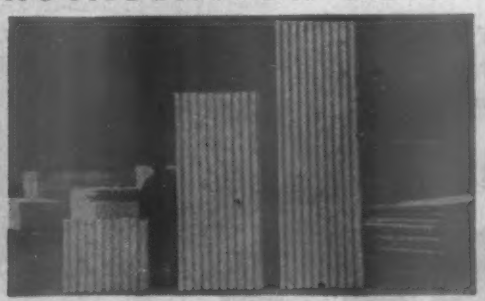
"Century" Asbestos Corrugated is easy to cut with portable electric or band saw, and easy to drill for drive screws or bolts. Cutting and fitting time is held to minimum because of 19 available sheet lengths. Salvage value is practically 100%.

If you'd like further information about "Century" Corrugated, write us, we'll be glad to help you.

INSTALLATION DETAIL



RIDGE ROLL



VARIOUS SHEET LENGTHS AVAILABLE

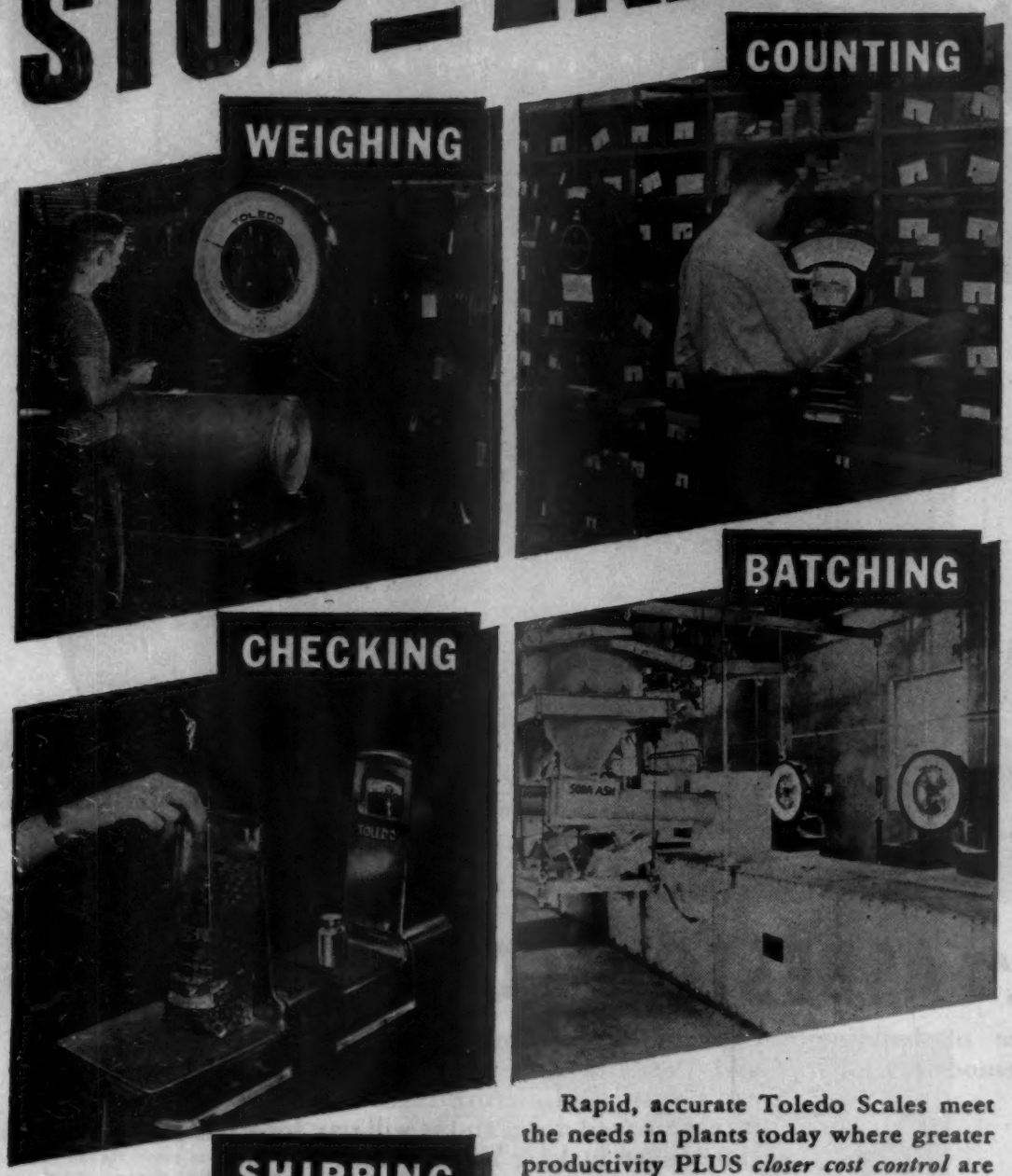
CORNER ROLL

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

Nature made Asbestos . . .
Keasbey & Mattison has been making it serve mankind since 1873

Reg. U. S. Pat. Off.

Control Costs!
STOP ± ERRORS



Rapid, accurate Toledo Scales meet the needs in plants today where greater productivity PLUS *closer cost control* are essential!

Toledo Accuracy prevents small errors from multiplying into big losses and high costs. Toledos save time by making each weighing operation quick and sure. Let Toledo help you with your control jobs in weighing, checking, testing, counting, batching, force-measuring. Toledo Scale Company, Toledo 12, Ohio.

New illustrated bulletin No. 2020 shows Better Ways to control costs.

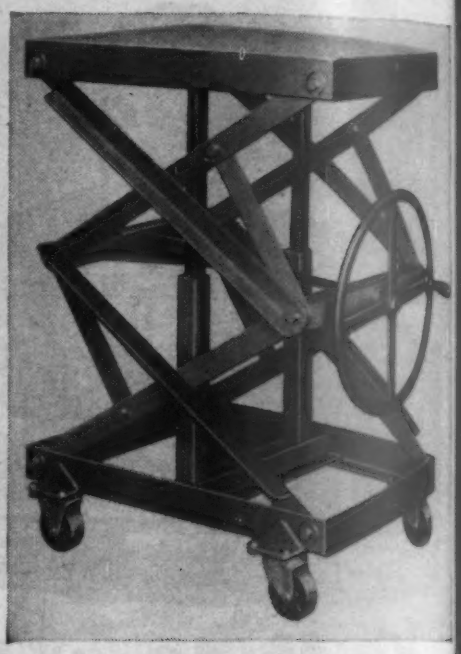
Send for this

TOLEDO
HEADQUARTERS FOR SCALES

five. The units are built to lift odd-shaped and unbalanced loads at almost any predetermined angle or level. They also can move simple loads, and are suitable for working in confined areas. The sling consists of an equalizing unit equipped with wire rope, and made up of a sheave (with V-shaped groove) carried by a spring-mounted axle, and a pair of brake shoes. The rope has a hook attached to each end, forming two legs. One leg will carry up to two-thirds of total load. The Caldwell Co., Dept 3, 1830 Camp Ave., Rockford, Ill.

ELEVATING TABLE

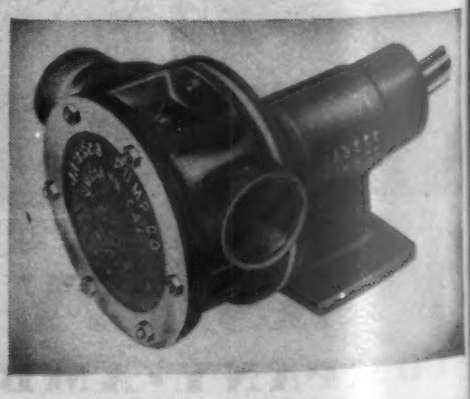
Scissors-type portable elevating table, made of steel throughout, is designed to lift and carry a 1-ton load. Remains fixed in any position. Minimum height



from floor is 26 inches, and maximum height 43 inches. Has two ball-bearing swivel and two stationary casters 4 inches in diameter. The table top is 20x32 inches, and over-all width of table is 26 inches. Can be operated by one man. Montgomery & Co., Inc., 53 Park Place, New York 7.

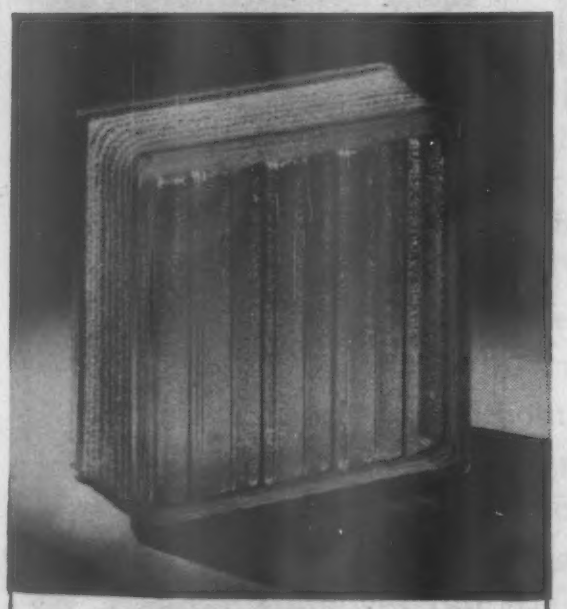
STAINLESS STEEL PUMP

Stainless steel, 18-8 Mo., Type 317 pump is simple in construction, having one moving part—a flexible impeller made of a neoprene compound. Its natural resilience results in automatic compensation for wear in the pump body, and facilitates passage of suspended solids without jamming. The pump primes automatically, operating suction being in excess of 27 inches of mercury. The liquid pumped provides automatic



lubrication between pump body and the

For six years, maintenance expense has been held down by panels of Insulux Glass Block installed in the Westinghouse Building, Atlanta, Ga. Insulux stays and looks clean with little or no attention. There is nothing to rot, rust or corrode, and painting is not needed. Through years of service, Insulux has proved its value to business. Architects, Robert & Company, Atlanta, Georgia.



INSULUX
GLASS BLOCK
AMERICAN STRUCTURAL PRODUCTS COMPANY
Subsidiary of
OWENS-ILLINOIS GLASS COMPANY

American Structural Products Company is a wholly owned subsidiary of the Owens-Illinois Glass Company. It has taken over the manufacture and sale of Insulux Glass Block and other Owens-Illinois structural products.

What's the business value of daylight?

MORE daylight . . . with privacy . . . is an asset for any business.

Insulux gives better working light over large areas. Distracting views are eliminated and transmission of outside noise is considerably reduced.

Infiltration of dust and dirt is reduced. There's no leakage around Insulux panels—an important point in many businesses where close control of processes is necessary. Insulating value of the block is high—often this simplifies heating and air conditioning, as well as lowering the cost of the operations.

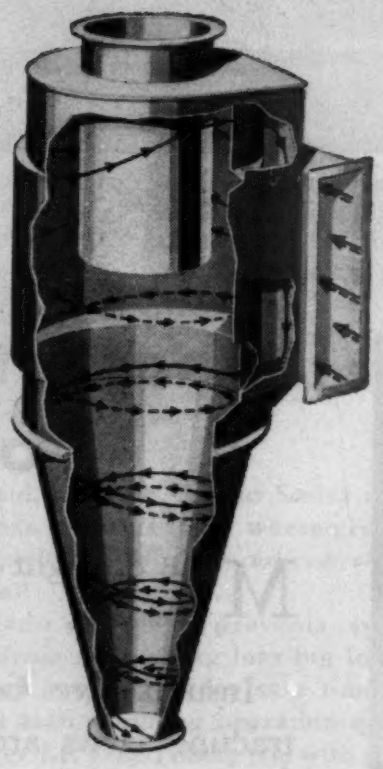
When your business plans modernization or new construction, the special advantages of Insulux Glass Block will probably fit into the picture. Details on request to Dept. E-102, American Structural Products Company, P.O. Box 1035, Toledo 1, Ohio.

in planning

Dust Recovery

The "Brass Tacks" Approach

is to get down to fundamentals. What equipment will collect dust particles in the sizes that count, with an efficiency you can count on, and at the most practical cost. . . . For economy, a system's got to be simple—without moving parts or need for maintenance. That means a Buell van Tongeren Cyclone, if you really want to trap the low-micron fines, too. Only the van Tongeren has the Shave-off, to put it in the high efficiency class. A Buell catalog makes this all plain. Write for one, its "brass tacks" approach makes it easy to read.



BUELL ENGINEERING CO.,
12 Cedar St., New York 5, N. Y.

buell

Engineered Efficiency in DUST RECOVERY

lubrication between pump body and the impeller. Ranging in speed from 100 to 1750 r.p.m., at 1750 r.p.m. it delivers 55 g.p.m. at 0 p.s.i. head, and 38 at 25 p.s.i. head. Jabsco Pump Co., 2031 North Lincoln St., Burbank, Calif.

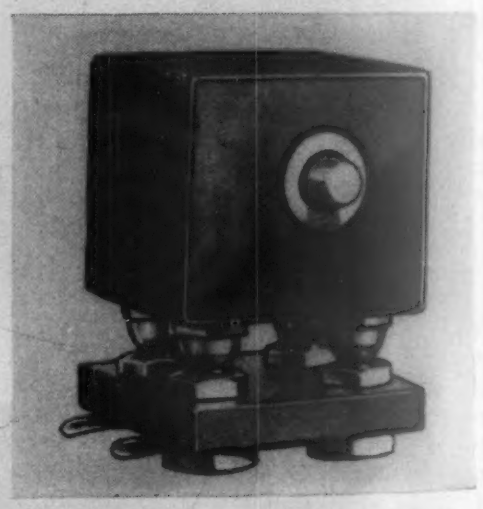
HEAVY-DUTY JACKS

Two heavy-duty hydraulic jacks, the 30-ton FB-11 and the 50-ton GB-11, combine load pump and speed pump in

one unit. The load pump cuts in automatically when the speed pump has raised the saddle to the load. The jacks are one-man operated. Blackhawk Mfg. Co., Milwaukee 1.

RENEWABLE SWITCH

Said to be for highly repetitive use, renewable switch Type 101 breaks both sides of the line. It is non-snap type, and



has practically no differential; requires a 5-oz. pressures and $\frac{1}{16}$-in. movement. Has $\frac{1}{8}$-in. overtravel. Can be used to control two circuits, breaking one side of the line of each; also for sequence making one circuit before the other. It is built for 10 amperes at 110-125 volts a.c., and is sometimes suitable for lower d.c. voltages and amperages. Congress Fan & Electric Co., P. O. Box 3747, Peninsula Sta., Daytona Beach, Fla.

ARC WELDING MACHINE

Hornet 36A motor generator arc welding machine, in 200-, 300-, and 400-amp. models, is a heavy-duty unit said to have

Approved by the Underwriters' Laboratories, Inc.

Coca-Cola* in CUPS

To Boost Employe Benefit Fund

For large potential outlets there are *two,* new Westinghouse Cup Vendors available *at no cost to you;* the VA-10 and V-4 which serve 1000 cups and 400 cups, respectively, without replenishing. Either of these are installed and serviced by your local Coca-Cola Bottler. All you need are small locations where employes can pause for a refreshing drink of ice-cold Coca-Cola.

IT'S NEW! It's automatic! Serves Coke* in cups . . . and *makes change* . . . a modern, easy, quick way to build employe morale, and the Vendor profits can be used for any employe benefit fund.

*"Coca-Cola" and its abbreviation "Coke" are the registered trade-marks which distinguish the product of The Coca-Cola Company.

CONTACT YOUR LOCAL BOTTLER

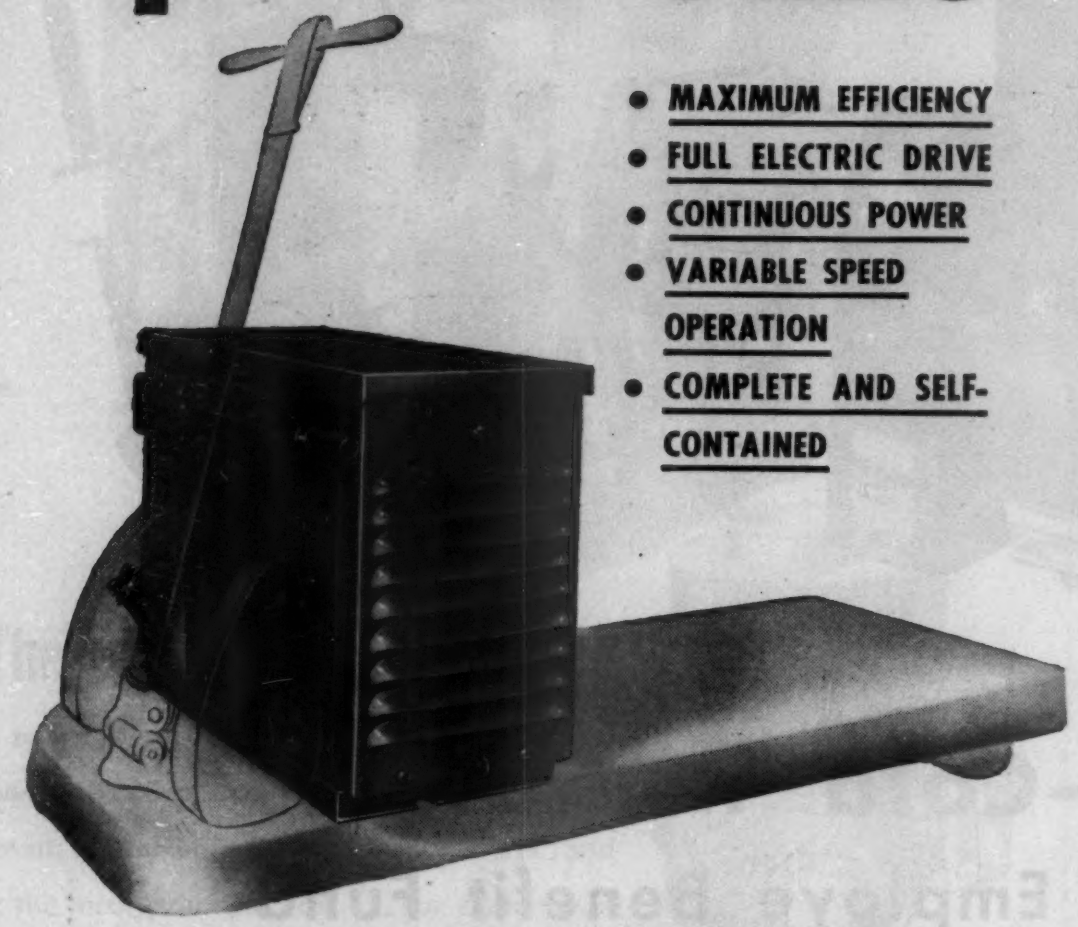
WESTINGHOUSE ELECTRIC CORPORATION

COCA-COLA COOLER DEPARTMENT • SPRINGFIELD 2, MASS.

Plants in 25 Cities . . . Offices Everywhere

MOTORIZED HAND-LIFT TRUCKS ARE BETTER WITH READY-POWER

gas-electric power units



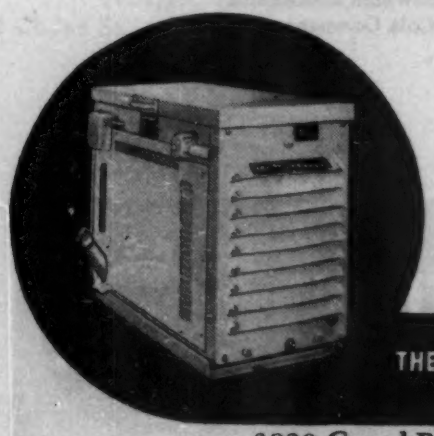
- MAXIMUM EFFICIENCY
- FULL ELECTRIC DRIVE
- CONTINUOUS POWER
- VARIABLE SPEED OPERATION
- COMPLETE AND SELF-CONTAINED

Ready-Power-equipped Motorized Hand-Lift Truck "inching" a load into a box car.

Ready-Power has been *preferred* power for electric industrial trucks for over two decades. The superior performance, long life and dependability of Ready-Power has earned the high regard of practical material movers.

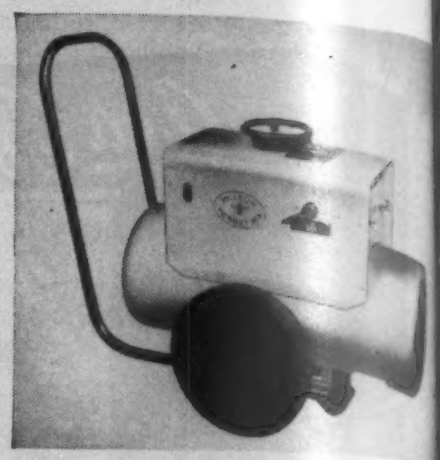
Now, after long, careful development, Ready-Power is available for Motorized Hand Lift Trucks. In Ready-Power Model "Z" Units, specially developed for this service, all the desirable features of Ready-Power become available for the users of these small, hard working material handlers.

Bulletin No. 114 describing Model "Z" Units will be mailed to you on request.



THE READY-POWER CO.

3820 Grand River Ave., Detroit 8, Michigan



simple current control. It is smaller in size and weighs one-third less than previous models. Built for either 220 or 440 volts, it requires no change in relays or additional wires for voltage reconnection. Wilson Welder & Metals Co., Inc., Dept. 1609P, 60 East 42nd St., New York 17.

STEEL CLAMP

"Quick-action" clamp is said to hold up to three pieces of material immovable with sufficient clearance top and bottom

to fit over tees, rolls, angles, channels and flanges. Self-aligning jaws hold on flat or irregular surfaces. One-hand-operated. Adjustable toggle handle allows jaws to open up to 2½ inches, and will clamp up to 1¼ inches of material. Roesch Tool Products Co., 8913 Olin St., Los Angeles 34.

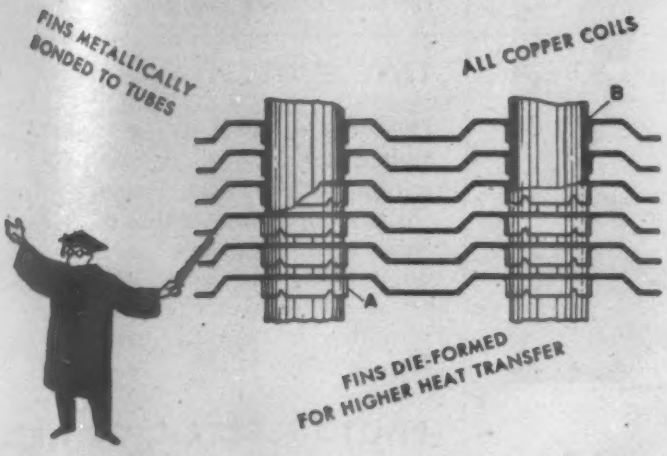
STEAM TRAP

Discharging air as well as condensate, lightweight Cub-Jr. steam trap can be suspended in a horizontal run of pipe without other support. Having two inlet connections at right angles to each other, the trap also may be utilized as an elbow in the line. Screwed inlet and outlet connections are furnished in ½- and ¾-in. IPS sizes. Handles up to 2000 pounds of condensate per hour on continuous discharge. At 60 p.s.i. the rating is 900 pounds. Maximum pressure for the trap is 125 p.s.i. Wright-Austin Co., 315 West Woodbridge St., Detroit 26.

PHASE-SHIFTING TRANSFORMERS

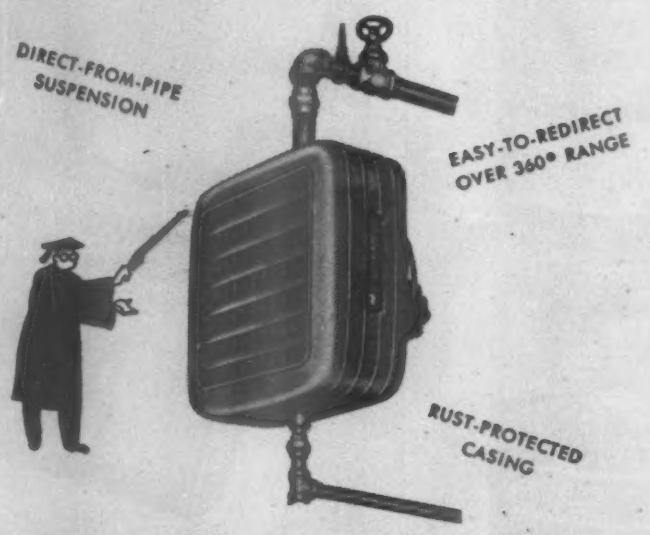
Line of adjustable phase-shifting transformers will convert standard watt-hour meters to k.v.a.-hour meters by the dis-

Here's Today's Lesson on Tomorrow's Unit Heaters!



1. *Consider construction*—Modine gives you a metallic bond which permanently seals the flanged collars of fins (A) to tubes (B) . . . prevents corrosion . . . assures you extra years of high heat transfer efficiency, lasting performance satisfaction.

2. *Take a peek at performance*— Modine scientifically planned heat distribution gives you heat where and when you want it. You get the exact temperatures you want because Modine air velocities and air volumes are carefully related to your needs.



3. *Remember suspension*—Patented center supply and return connections mean you can suspend Modine Horizontal Units directly from the supply line with savings up to $10 per unit. Complete safety. No expensive supports. No extra labor costs.

4. *Measure the need*—Modine's integrated unit heater line gives you 3 types with 47 basic capacities. 1) Horizontal Type for general applications. 2) Vertical Type for overhead use. 3) Power Throw Type for special high velocities.

MORAL: Move Ahead with Modine Quality!

When you buy Modine, you buy the quality unit heater that's years ahead in engineering and design. Built to meet almost all the space heating requirements of modern industrial and commercial buildings, Modines give you modern beauty, plus the finest in modern performance and construction. Get all the facts from Modine's representative listed in the "Where-to-Buy-it" section of your phone book. Or send in coupon at right.

MODINE MANUFACTURING CO.
1505 Dekoven Ave.
Racine, Wisconsin

YES! I want all the facts about Modine's Integrated Unit Heater Line. Please send me complete information.

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ADDRESS .....

CITY ..... STATE .....

Modine UNIT HEATERS

STOP FIRE FASTER

WITH AN

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FIRE EXTINGUISHING EQUIPMENT

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FIRE EXTINGUISHER

● FASTER fire-stopping power is your first requirement when fire breaks out... and Ansul Dry Chemical Fire Extinguishers give you that extra margin of protection against major fire damage.

● In addition, you get GREATER fire-stopping power... because Ansul Plus-Fifty Dry Chemical releases its flame smothering gases in the heart of the flames.

● For fires in flammable liquids and in electrical equipment, Ansul Dry Chemical Fire Extinguishers provide greater protection... pound for pound and dollar for dollar than any other extinguisher.

Get the facts. Ask for authoritative comparative ratings as determined by a national approval agency.

MADE BY THE MANUFACTURERS OF ANSUL DRY CHEMICAL FIRE EXTINGUISHERS, MODELS 4, 20, 30, 150-A AND 350-A.

ANSUL CHEMICAL COMPANY
FIRE EXTINGUISHER DIVISION, MARINETTE, WISCONSIN

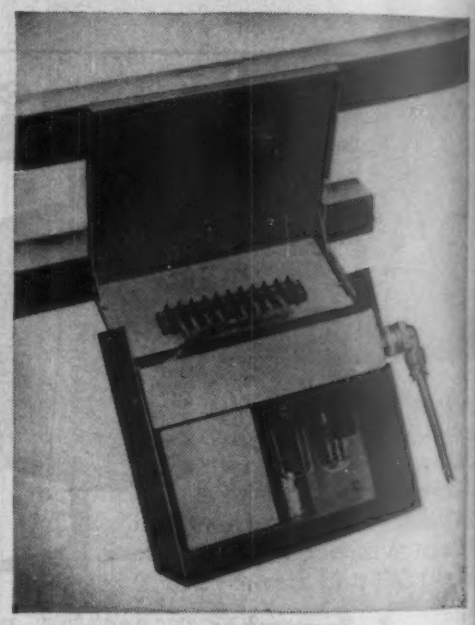
placed voltage method. They shift the voltages by 0, 30, 45, and 60 degrees corresponding to 100, 86.6, 70.7, and 50 per cent power factor respectively, depending on the position of movable plugs inserted in radio-type sockets in the units. Five types are available: Type K-12, for 2-phase, 3-wire connections; Type K-13, for 3-phase, 3-wire; Types K-14 and K-18, for 3-phase, 4-wire; and Type K-17, for 3-phase, 4-wire delta connections. Westinghouse Electric Corp., P.O Box 868, Pittsburgh 30.

TIME SWITCH

Over-all dimensions of Type S time switch are 3x5⅜x3 inches. Powered by a high-torque, synchronous, self-starting, 450-r.p.m. motor that is permanently lubricated. Operates on 120 volts, 60 cycles, a.c. The switch can be mounted on a standard switchbox, or surface mounted on a wall. Sangamo Electric Co., Springfield, Ill.

PHOTO-ELECTRIC CONTROL

PR 400 Series Photo-Electric Control Amplifiers are designed for automatic control of machinery or to serve as an indicator or warning device. Said to



have high speed response and sensitivity without sacrifice of stability under normal industrial conditions. Case and chassis on which electronic components are assembled are made of heavy-gage steel. The unit is built in two parts—the case, containing the control-amplifier unit, and the base, with mounting holes and knockouts for electric fittings. Power requirements are 115-230 volts, 50-60 cycles a.c. Langevin Mfg. Corp., 37 West 65th St., New York 23.

DRILL ATTACHMENTS

Four interchangeable lightweight attachments for electric hand drill and drill press enable user to sand, drive screws, polish, grind, and file, in addition to sawing wood, steel, plastic, and similar materials, with the same power unit. There are no gears or crankshafts to wear out. All working parts are case-

A COST REDUCTION TEAM

Backed by 35 years' experience

One man and a Mercury Fork Truck speed the flow of materials from receiving, through process, to shipping—load, unload and tier to ceiling height with ease. Powerful, versatile—this handling team does the work of four or more men—faster, easier and at lower cost.

Mercury, with over 35 years in the design, manufacture and installation of material handling equipment, is well qualified to recommend the handling system that meets your particular requirements. For on the spot consultation, ask a Mercury Sales Engineer to call. There is no cost or obligation.

FREE: CATALOG NO. 7-11

New Mercury Catalog illustrates and describes all Mercury equipment—including newest additions to Mercury's expanded material handling line. Request your 52 page copy—today.

Mercury "Yak" Fork Truck quickly stacks heavy load of sheet steel. Capacity, 4,000 lbs.

Most powerful fork truck in the Mercury line, the "Yank" tiers two pallet loads quickly and accurately. Capacity, 6,000 pounds.

THE MERCURY MANUFACTURING CO.
4110 S. Halsted St., Chicago 9, Ill.

THE TRACKLESS TRAIN

MERCURY

TRACTORS • TRAILERS • LIFT TRUCKS

Cut Costs in Your Shipping Room with

BEND-N-RAP combines the cushioned protection of corrugated with the speed and economy of wrapping paper. Flexible in any direction, BEND-N-RAP wraps and protects objects of any size, any shape with new *speed*—new *economy*.

Used as inner unit packing, BEND-N-RAP saves time, space.

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USING ORDINARY PACKING MATERIALS

Compact rolls of BEND-N-RAP consume less space in storage than excelsior, shredded paper, etc. BEND-N-RAP consumes less space in the package, too—enabling you to pack more units to the carton or to decrease the size of the packed carton. More—BEND-N-RAP is cleaner, faster, easier to use.

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BEND-N-RAP MAKES A FASTER, NEATER, SAFER PACKAGE

USING BEND-N-RAP

USING ORDINARY PACKING MATERIALS

BEND-N-RAP saves time—no paper and twine are needed. BEND-N-RAP makes a smooth, neat package—the kind you'll be proud to have going out of your Shipping room. BEND-N-RAP gives your packages *corrugated cushion* protection.

GET THE COMPLETE COST SAVING STORY

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MAIL THIS COUPON TODAY

Please send me, without obligation, the cost-saving story of BEND-N-RAP, including speed-wrapping instructions.

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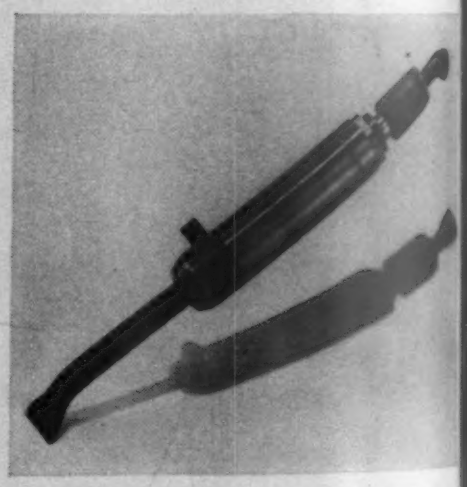
hardened for maximum wear. J. D. Whittle Co., Small Tools Div., 208 North Wells St., Chicago 6.

SAFETY RELIEF VALVE

Inlet pressures up to 2000 pounds, and temperatures up to 900 deg. F. can be handled by safety relief valve, for corrosive liquids, vapors, or gas. Designated Type 2680, the valve is made of cast steel with stainless steel trim. A high disk lift permits full capacity discharge. Nozzle body is of long neck construction to permit proper nozzle flow without restriction. Body is ribbed to absorb piping stresses. Stainless steel baffle plate restricts flow of vapors into spring chamber. The valve is available in sizes from 1½x2 to 6x8 inches. Parts are interchangeable. Farris Eng. Corp., 531 Commercial Ave., Palisades Park, N. J.

SCALING HAMMER

Type S-1 scaling hammer has a graduated control in the throttle which gives a choice of blows to be delivered. Light pressure on the valve meters sufficient air for light work, and heavier pressure

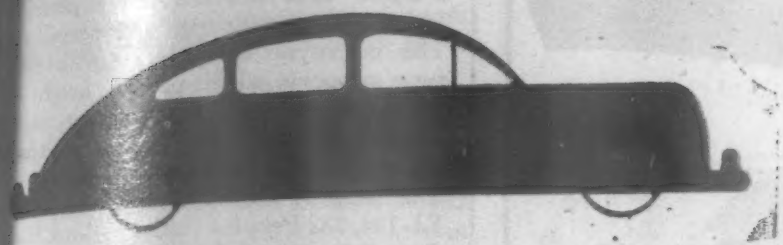


gives power for heavy cuts. Exhaust air cleans away chips and scale. The chisel retainer allows removal of chisel by thumb pressure. The wafer valve is stainless steel. Chisels are furnished in blank form, flat form, and spoon form, and a line of star drills is available in sizes 3/16 to ¾ inch. The Rotor Tool Co., 17325 Euclid Ave., Cleveland.

POWER BELT CONVEYOR

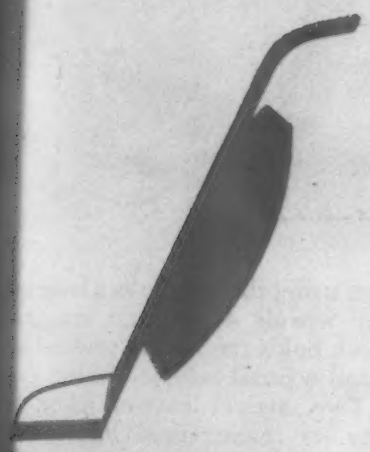
Standardized multi-purpose power belt conveyor, called Floor-Veyor, Jr., is built for moving medium-weight loads between floors or horizontally. Supplements the heavy-duty standard Floor-

DO YOU BUILD AUTOMOBILES?



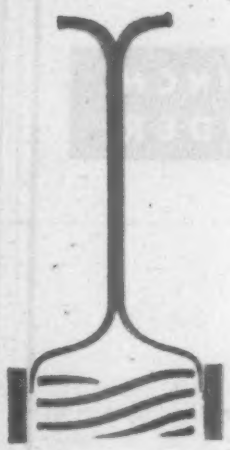
OSTUCO Seamless Steel Tubing and one OSTUCO fabricating operation—bending—combine to produce seat frames for a nationally-known automobile manufacturer. Complete frames are delivered to the assembly line, ready for immediate installation.

VACUUM SWEEPERS?



Vacuum sweeper handles aren't as simple to produce as you may think! This one, for example, requires bending, slotting, tapering, flaring and beading—operations that OSTUCO completes for this manufacturer, who saves hours and dollars in production time and costs.

LAWN MOWERS?



Next time you mow the lawn, take a good look at the handle of your mower. If it's one of the new, lightweight models, it's probably made of OSTUCO Tubing, with the necessary bending, piercing, flattening and shearing operations all performed by OSTUCO.

PERHAPS NOT . . . but, whatever your product, there's a good possibility it can be built better with tubing, and an even better possibility it can be built at far less cost. The examples illustrated are typical of the many products, in every industry, on which OSTUCO Tubing has cut production time and costs.

Fabricating and forming tubing is a task for specialists . . . experienced OSTUCO engineers and efficient OSTUCO craftsmen . . . men who can translate your blueprint requirements into a finished product that meets the most exacting specifications. OSTUCO Tubing, formed or fabricated to your requirements, can greatly simplify your production problems.

You can get the complete story of OSTUCO production-assistance from the nearest sales office . . . write today, without obligation.

OSTUCO

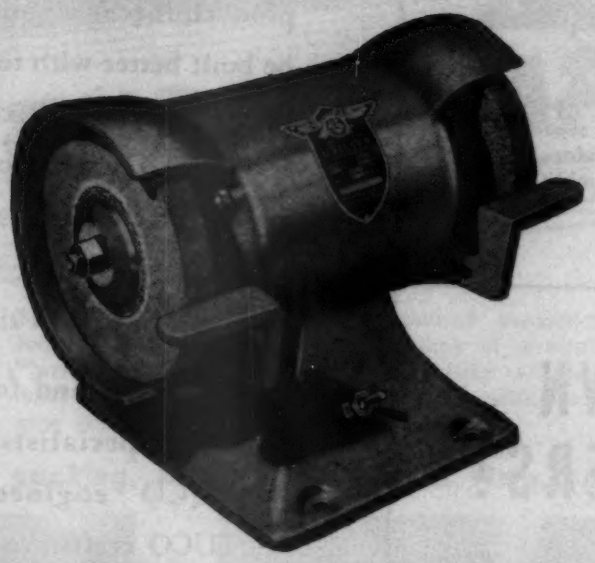
THE OHIO SEAMLESS TUBE COMPANY

Plant and General Offices: **SHELBY, OHIO**

SALES OFFICES: CHICAGO, Civic Opera Bldg., 20 North Wacker Dr. CLEVELAND, 1328 Citizens Bldg. • DETROIT, 2857 E. Grand Blvd. HOUSTON, 927 A M & M Bldg. • LOS ANGELES, Suite 200-170 So. Beverly Drive, Beverly Hills • MOLINE, 309½—16th St. • NEW YORK, 70 East 45th St. • PHILADELPHIA, 1413 Packard Bldg., 15th & Chestnut • ST. LOUIS, 1230 North Main St. • SEATTLE, 3205 Smith Tower • SYRACUSE, 501 Roberts Ave. • CANADIAN REPRESENTATIVE: Railway & Power Corp., Ltd., HAMILTON, MONTREAL, NORANDA, NORTH BAY, TORONTO, VANCOUVER and WINNIPEG.

AMERICA'S GREATEST GRINDER VALUE

FOR SHIPMENT NOW



UNITED STATES 6-INCH UTILITY BENCH GRINDER

Reddy

Compact . . . powerful . . . precision-engineered . . . precision-built. Sturdy construction . . . well balanced. Brilliant scarlet housing.

MOTOR: 1/3 hp, 3450 rpm, permanent split capacitor totally enclosed ball-bearing motor. WHEELS: 6" x 3/4" x 1/2"; one coarse and one fine. TOOL RESTS adjustable to wheel wear.

REDDY for • tool grinding
• buffing • wire brushing
• polishing • general purpose grinding

For shops, garages, farms, home workshops and general industrial uses.

CONTACT YOUR DISTRIBUTOR OR WRITE DIRECT

The UNITED STATES ELECTRICAL TOOL Co.
CINCINNATI, OHIO

Veyor power belt conveyor. Furnished in multiples of 2½- to 30-ft. lengths, the conveyor may be converted to meet changing needs by addition or removal of conveyor bed sections, and lengthening or shortening the belt. The frame is light in weight, reinforced by the cross-section. Has provisions for attaching legs, ceiling supports, and accessories. The conveyor is equipped with boot-type supports which provide height adjustment of drive and take-up pulley ends of the unit. May be operated with the ⅓- or ¾-hp. motor at either end. The Rapids-Standard Co., Inc., Dept. FJ-124, 342 Peoples National Bank Bldg., Grand Rapids 2, Mich.

TOTEPAN LIFT TRUCK

Built of tubular and formed steel parts, a 600-lb. capacity truck lifts and transports totepans either singly or in stacks. Open forks engage the side handle or lip of totepans and lift the load by a downward push of the operating handle. Elevation is performed by mechanical

leverage, using the handle as a lever and the rear wheels as fulcrum. An automatic lock holds the load in elevated position, and a pedal release controls lowering. Two swivel casters allow the truck to be maneuvered into narrow quarters. Lyon-Raymond Corp., 4566 Madison St., Greene, N. Y.

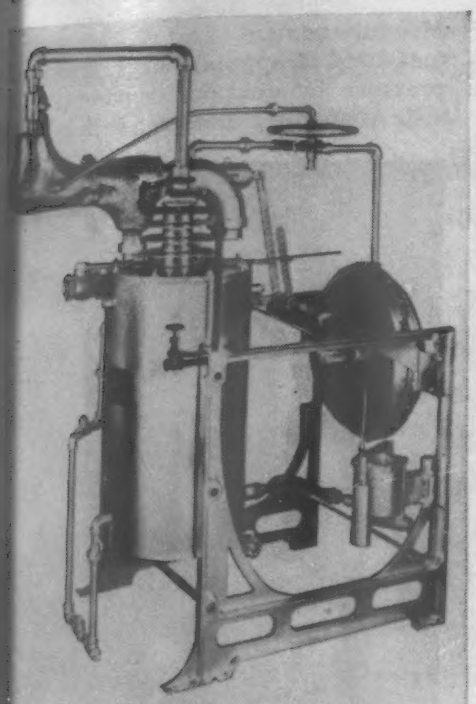
OIL BURNER CONTROL

Fireye Control Type 24PJ8 provides automatic starting and programming control for oil burning equipment. It can be used with photo-electric flame failure scanner Type 45PH5, which protects the oil burning installation from flame failure. The control automatically starts burner in operation, and programs a sequence of fuel valve opening, post-

ignition time, priming, and scavenging. The timing cams are driven by a high-torque synchronous motor. The fuel valve delay and post-ignition periods can be set on installation, and a calibrated dial indicates timing adjustment in seconds. The equipment is housed in dust-tight case. Operates on 115/230 volts, 60 cycles. Combustion Control Corp., 77 Broadway, Cambridge 42, Mass.

GENERATOR

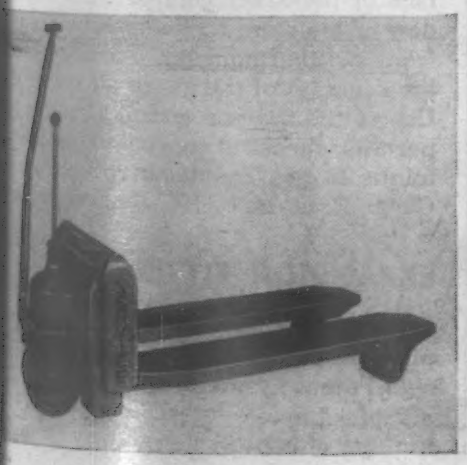
Made of cast aluminum, redesigned generator is said to produce safe, low-cost gas from fuel oil for industrial ovens



and furnaces. It is used as a gas "standby" because of its quick switchover to gas without interruption of flame or change of flame quality. Automatically maintains constant manifold pressure and air-gas ratios from a reducing to an oxidizing flame. Gas produced has low hydrogen content, resulting in less scale on ferrous work. Manufacturer claims it furnishes a clean, sootless flame having no contaminating odor. Vapofier Corp., 10316 South Throop St., Chicago.

PALLET LIFT TRUCK

Leverlift, 4000-lb. capacity lift truck, for double-faced pallet handling, features a set of "toggle booster" rollers. The rollers are claimed to float the truck frame over the bottom face of the pallet



SURE FOOTING ...wet or dry!

IN the danger zones of your plant — places where safe footing is essential —you can reduce possibilities of accidents by installing U·S·S Multigrip Floor Plate. Vehicles roll easily . . . straight and true. The arrangement of Multigrip's closely spaced risers assures traction and skid resistance in every direction. The flat-topped risers are comfortable underfoot, tend to reduce fatigue.

Multigrip is easily cleaned. It drains freely in any direction . . . there are no pockets in which dirt and water can accumulate. Multigrip gives added protection to underflooring—strengthens it structurally — and remains safe under wear and tear of pedestrian and vehicular traffic for years.

Get further information about Multigrip Floor Plates from your nearest steel warehouse or write to us direct.

LISTEN TO . . . *The Theatre Guild on the Air,* presented every Sunday evening by United States Steel. American Broadcasting Company, coast-to-coast network. Consult your newspaper for time and station.

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Pittsburgh and Chicago
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
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8-107

UNITED STATES STEEL

a Program You'll Find Profitable to "CHAMPION" in Your Plant

You can take that two ways — both of them good business for you.

1. *Planned Lighting* is a cause worth *championing* from every standpoint — quality and quantity of output, worker morale, accident reduction, long-run economy.

2. CHAMPION Fluorescent and *Incandescent* Lamps for your planned lighting program give you efficient, dependable industrial lighting. CHAMPION manufacturing, testing and control methods assure lamp quality that is second to none. CHAMPION's policy of low overhead and clean-cut distribution through selected industrial distributors assure minimum lamp and lighting costs.

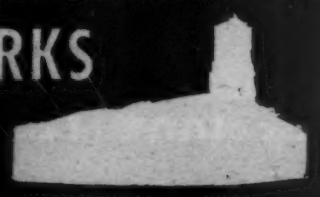
DEDICATED TO PLANNED LIGHTING

This modern plant and everyone in it is working night and day to implement your planned lighting program with the finest lamps that can be produced by modern equipment backed by forty-eight years of experience.

CHAMPION LAMP WORKS

Lynn, Massachusetts

A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.



without displacing it when loading. The short-stroke vertical pump handle facilitates elevating the load under congested conditions. A hand-operated release valve permits regulating lowering speed. The truck is of pressed steel and welded construction. Built-in hydraulic safety valve prevents overloading. The truck has 10-in.-dia. front wheels, and is available in fork lengths of 36, 42, 48, 54, and 60 inches. Lowered height is 3½ inches, lift is 4 inches, and over-all height is 27 inches. Service Caster & Truck Corp., Albion, Mich.

DEWPOINT INDICATOR

Moisture content of air and gases can be measured at approximately atmospheric pressure by dewpoint apparatus. Consists of an outer container with inlet and

outlet connections, and a glass window through which an inner container is visible, and a thermometer. To determine the dewpoint temperature a small sample of the gas to be tested is passed through the outer container while a mixture of crushed dry ice and acetone is stirred with the thermometer in the inner container. When the polished surface of the inner compartment displays dew or moisture the temperature is read from the thermometer, indicating moisture content of the gas or air under test. Use of the acetone and dry ice mixture permits checking dewpoints as low as minus 76 deg. C. Pittsburgh Lectrodryer Corp., P. O. Box 1766, Pittsburgh 30.

EXPANSION FITTINGS

Line of anchor base expansion joint pipefittings for steam lines includes a side *T*, foot *L*, lateral *L*, and reducing *T*, all of stainless steel. In side *T* the number of bellows flanges may be varied

AVOID THE LUXURY TAX

on Idle Horsepower

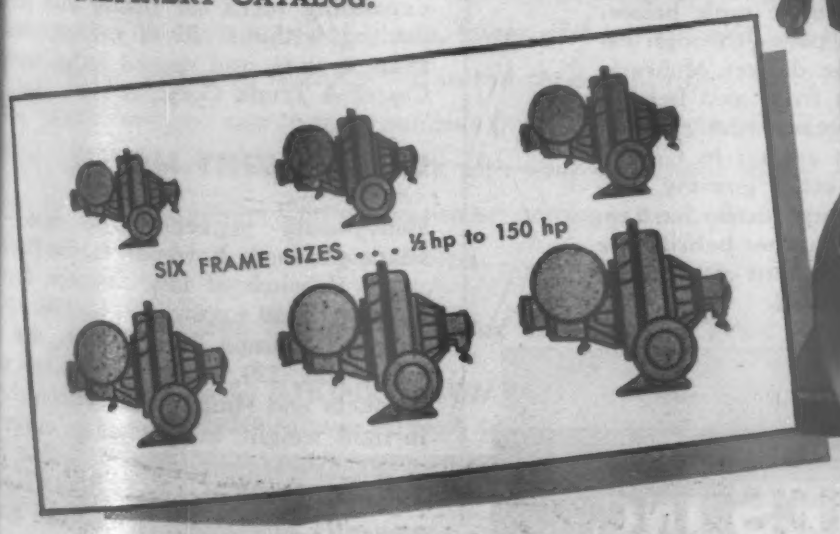
When your horsepower needs are small, why pay the extra cost of larger turbines, designed for much more power than you require?

You pay only for the horsepower you need when you fit the right Coppus "Blue Ribbon" Turbine to the load. They're made in six frame sizes . . . from 150 hp down to fractional . . . priced in proportion to their size.

That's why you'll see more and more Coppus turbines powering pumps, blowers, fans, stokers and other equipment requiring a steady source of small hp. *Steady* is the word for these busy little turbines. Like all Coppus "Blue Ribbon" products (blowers, ventilators, gas burners, etc.) each Coppus turbine is precision-made, with close tolerances checked by Johansson size blocks. And before shipment, the turbine you get is dynamometer-tested.

No wonder more than 85% of all orders for Coppus turbines since 1937 have been repeats . . . and that a growing number of nationally known manufacturers are installing "Blue Ribbons" on their original equipment.

Write for Bulletin 135–10. COPPUS ENGINEERING CORPORATION, 102 Park Avenue, Worcester 2, Mass. Sales Offices in THOMAS' REGISTER. Other products in BEST'S SAFETY DIRECTORY, CHEMICAL ENGINEERING CATALOG and REFINERY CATALOG.



Carries Away Overspray . . . IN A WHIRLING TORNADO OF WATER

Exterior view of above installation

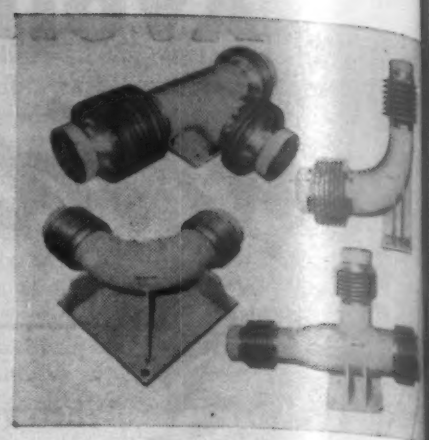
Compact unit for smaller spraying jobs

PAINT-LADEN AIR IS "TORNADO" CLEANED. Operators, working in a Schmieg Centri-Merge Spray Booth, are adequately protected from fire and fumes. Overspray is carried on an air stream *horizontally* away from work into a curtain of water, pressure-fed through slots extending continuously full width of booth, that descends down the flood sheet. The mixture of fume and paint-laden air and water is then whirled under the flood sheet and hurled with tremendous impact against the impingement wall at back of booth. Down this impingement wall flows an additional sheet of water that floods the foreign matter, pounded out in the process, into the sludge tank below. Only CLEAN AIR passes through exhaust fan. Thus the danger of fire is suppressed both in front and behind the flood sheet. Because the ratio of water and air is far greater in Centri-Merge, paint and other gummy substances do not pile up on the hard-to-get-at walls of the chamber behind the flood sheet; therefore, cost of repeated cleanings is eliminated.

Consult Schmieg engineers regarding your problems of dust and fume control.

THE *best* AIR PURGE *is* CENTRI-MERGE

Schmieg INDUSTRIES INC.
Engineers & Manufacturers
309 PIQUETTE AVENUE • DETROIT 2, MICHIGAN



to accommodate unequal expansion each leg. Minimum welding is requir Pipes need only be led to the fitti point and joined to proper unit, whi is complete with anchoring base. Ma nilastic, Div. of Cook Electric Co., 2 Southport, Chicago 14.

FORK LIFT TRUCK

All controls and the full-vision instru ment cluster are incorporated in stee ing column of redesigned Motowlift for lift truck. A single lever at the driver fingertips controls all hydraulic opera tions. Design of seat frame and flo

plates provides accessibility for main tenance. Enclosure of the top mecha nism minimizes entry of dust or dirt i the ram assembly. Includes redesigne heavy-duty transmission and steerin arrangements. Comes in 3000- an 4000-lb. solid rubber-tired models, i 108- and 144-in. lifts, and a pneumatic tired model. Accessories include air expanding forks for lifting and trans porting without aid of pallets, scoop rams, cranes, and special forks. Servic Caster & Truck Corp., Albion, Mich.

LIGHTWEIGHT MOTOR

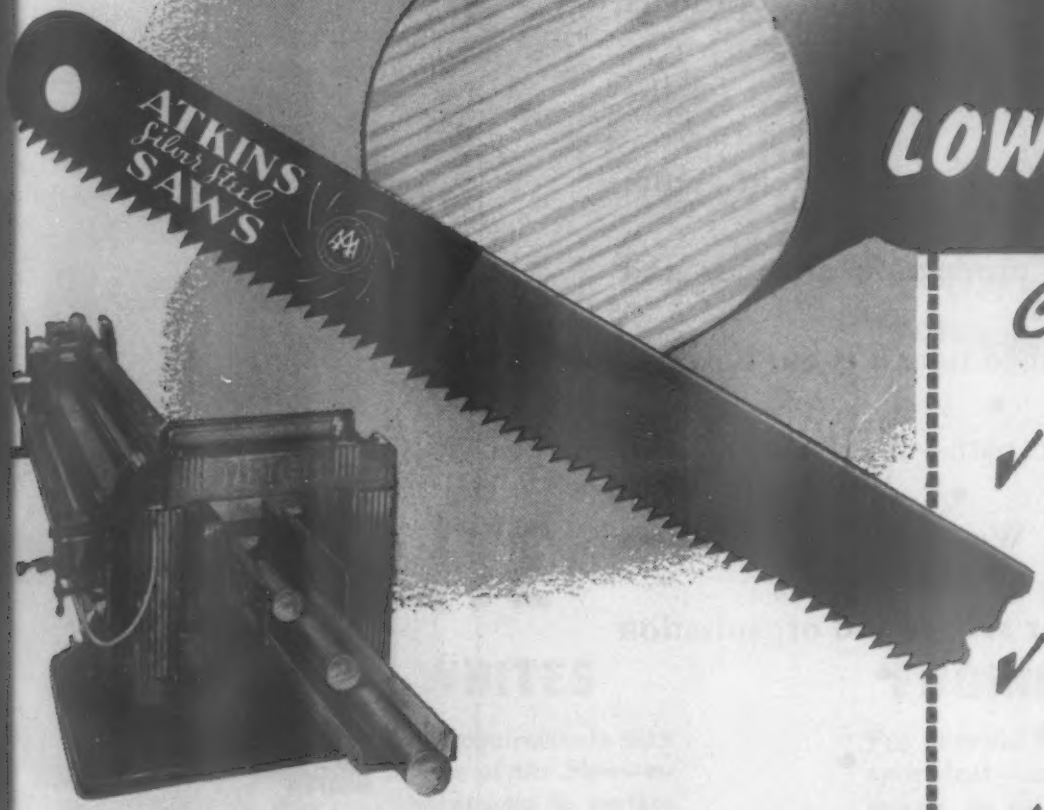
Heavy-duty capacitor-type motor i single phase, ½ horsepower, for 115/23 volts. Because of low slippage, 2-pol develops 3520 r.p.m.; 4-pole, 1760 r.p.m Draws 6.8 amps. on 110 volts, and 3. amps. on 220 volts. Aluminum en brackets and simple construction resul in light weight. It operates on either 5 or 60 cycles. Named Workhorse, it ha 16-gage sheet steel case, and is per manently lubricated. Having ball bear

ATKINS

Silver Steel BLADES

MORE CUTS PER BLADE

LOWER COST PER CUT



Atkins "Silver Steel" Blades in your hacksaw machines mean faster metal cutting at lower cost. Because of famous Atkins "Silver Steel," these blades hold their extra-keen tooth-edge longer. How this pays off in more cuts per blade, lower cost per cut and less time lost in blade changing is illustrated in the reports at right.

To see how you can speed your own production . . . cut your down-time . . . save your dollars . . . check with your distributor today. Ask him to have an Atkins Cutting Engineer arrange an actual demonstration on work of your own choice.

Check THESE TYPICAL CUTTING REPORTS

✓ **160 CUTS**
Atkins "Silver Steel" Blade made 160 cuts through 6" diam. S.A.E. X1335 (approximately 4512 sq. ins.) Blade still good.

✓ **4270 SQUARE INCHES**
After cutting 4270 sq. ins. of S.A.E. X1335 Atkins Blade still good for more.

✓ **32 CUTS**
Atkins Blade made 32 cuts through 4" dia. stainless steel (Type No. 303) at average 12" per cut.

✓ **610 CUTS**
After 610 cuts on 3" S.A.E. X1335 Atkins Blade in good condition.

✓ **165 CUTS**
After 165 cuts through 6" diam. S.A.E. X1335 Atkins Blade in good condition.

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ATKINS "ATKINS ALWAYS AHEAD" — MAKERS OF BETTER SAWS FOR EVERY CUTTING JOB

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GOOD ENGINEERING
is the shortest path between two points

Probably you have never considered *Engineering* in this respect, but, in the manufacturing end of any business, engineering can be the determining factor between a safe cost figure and a competitive selling price. There are many steps in producing a product for market. Any one of these steps might be the "road block" in your planning for profit. From product design, through production methods and quality control of the finished item it is our business to establish the shortest path—the best way—to profitable manufacturing. We urge you to become better acquainted with our service and organization through our brochure . . .

The Answers
TO INDUSTRY'S PROBLEMS

This fact-packed, informative booklet tells how we can *engineer* a product from design to the shipping door—OR—merely step in and untangle your knotty problems. Please write on your business letterhead.

Pioneer Engineering and Manufacturing Company
19644 JOHN R ST., DETROIT 3, MICHIGAN
PIONEERing Better Production Methods and Tools

ings throughout, it can be run in any position, operating at 40-deg. temperature. A cooling system constantly circulates air between the frame and the laminations. Winding is heavy Fornvar insulated wire, varnish-impregnated and baked. Motor is said to withstand a 25 per cent overload indefinitely. A 3-phase, ¾-hp. model also is available, as are special mountings. Crozier Machine Tool Co., Hawthorne, Calif.

GENERATORS

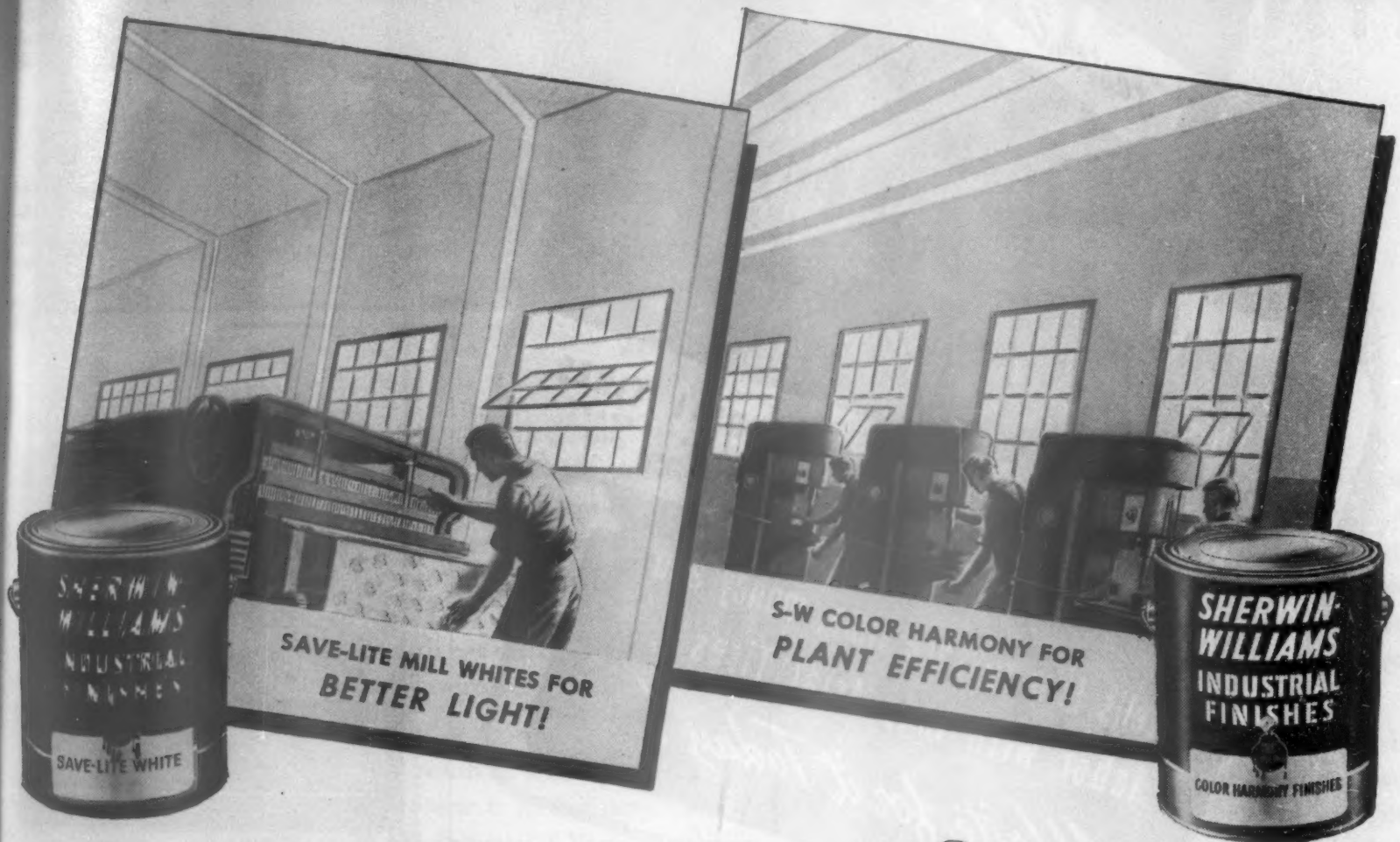
Three 20- and one 50-kw., 450-kc. radio frequency generators are announced. Type A, a single-position unit, has built-in worktable and Transite table top suited to brazing and soldering; Type B, a single-position unit for hardening ap-

plications, has a built-in work sink, two sets of water fittings, and a current transformer; Type C, a two-position unit, combines a built-in work sink, two sets of coil and quench water fittings, and two current transformers with automatic transfer switch; and the 50-kw. unit may be furnished with a matching two-position worktable with built-in sink. They incorporate stepless power output control. The 50-kw. generator operates on 230/460-volt, 3-phase, 60-cycle current. Westinghouse Industrial Electronics Div., Plant No. 4, Baltimore 3.

FLOORING MATERIAL

Stain-, scar-, and flame-resistant flooring material possesses the resilient, long-wearing qualities of rubber floor covering, according to the manufacturer. Described as a homogeneous mixture of

S-W COVERS BOTH SIDES of the MAINTENANCE PICTURE!


SAVE-LITE MILL WHITES FOR BETTER LIGHT!
S-W COLOR HARMONY FOR PLANT EFFICIENCY!
SAVE-LITE WHITE
SHERWIN-WILLIAMS INDUSTRIAL FINISHES
COLOR HARMONY FINISHES

1. SAVE-LITE

NEW IMPROVED WHITES

No matter *what* maintenance painting requirements may be in your plant, you can count on *one* of the Sherwin-Williams Save-Lites to give you the utmost in surface protection . . . *PLUS* lasting whiteness for the ultra-high light reflection factor that enhances safety, reduces rejects, cuts unit costs.

There's a Save-Lite White for: moderate-cost maintenance; outstanding resistance to fumes; moisture resistance combined with high-speed drying; resistance to *both* moisture and fumes, also with the fast-dry feature.

Each of these four Save-Lites is a product of Sherwin-Williams Industrial Research—and *that* means tops in its field!

Products of SHERWIN-WILLIAMS INDUSTRIAL RESEARCH

2. COLOR

ENGINEERED FOR INDUSTRY

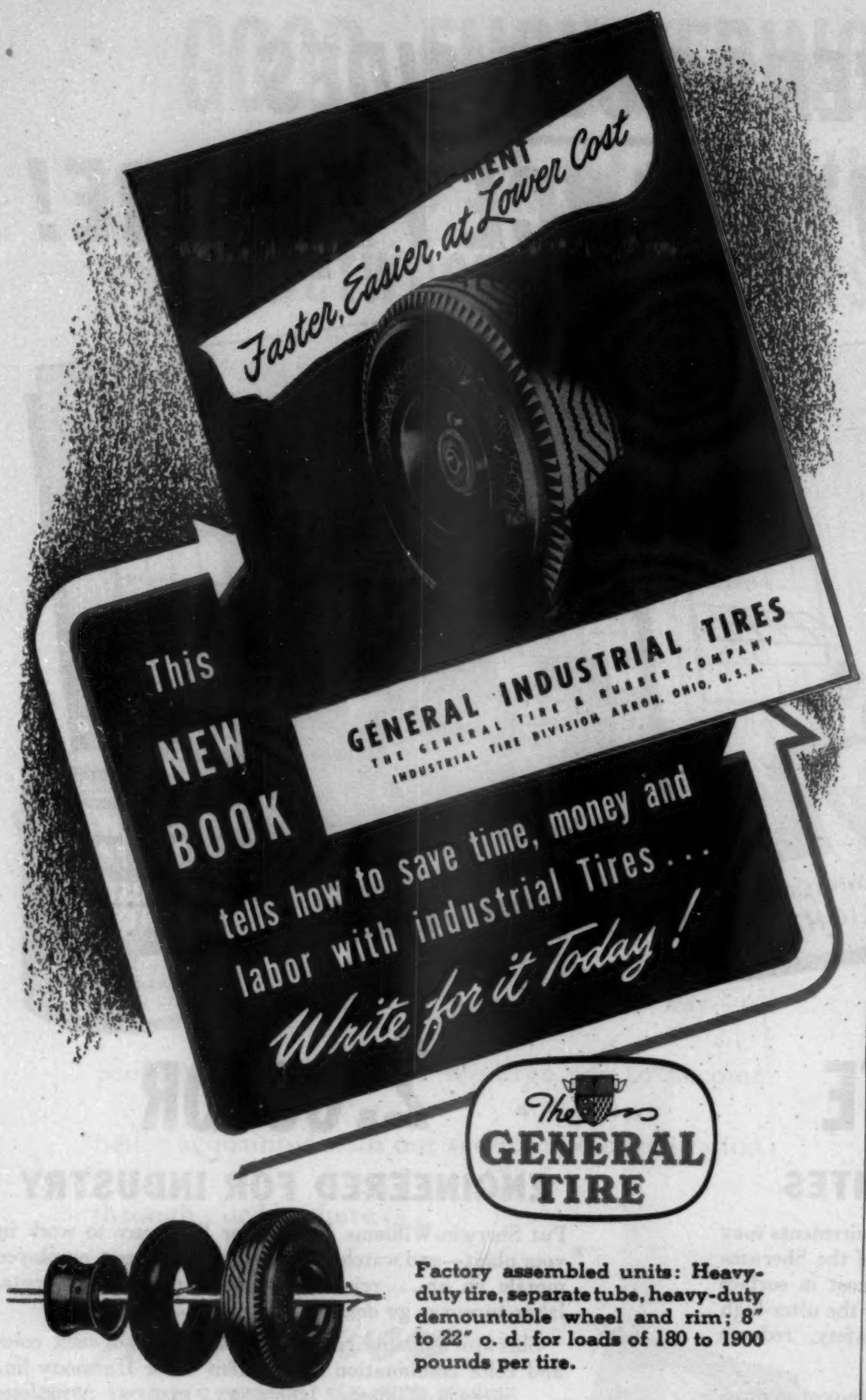
Put Sherwin-Williams Kem Color Harmony to work in your plant—and watch product quality, output, employee morale go *up* . . . rejects, fatigue, eyestrain, accidents, labor turnover go *down!*

Sherwin-Williams color specialists *selected* each color and color combination in the Kem Color Harmony line . . . Sherwin-Williams laboratory experts *formulated* every finish for exceptional durability *at the point of use* . . . *engineered* all the colors into a group of comprehensive color harmonies that bring increased output, improved working conditions, lower costs into *every* industry.

★

Let us tell you how *you* can make the fullest use of Color Harmony. The Sherwin-Williams Co., Industrial Division, Cleveland 1, Ohio. (Export Division, Newark, N. J.)

SHERWIN-WILLIAMS INDUSTRIAL FINISHES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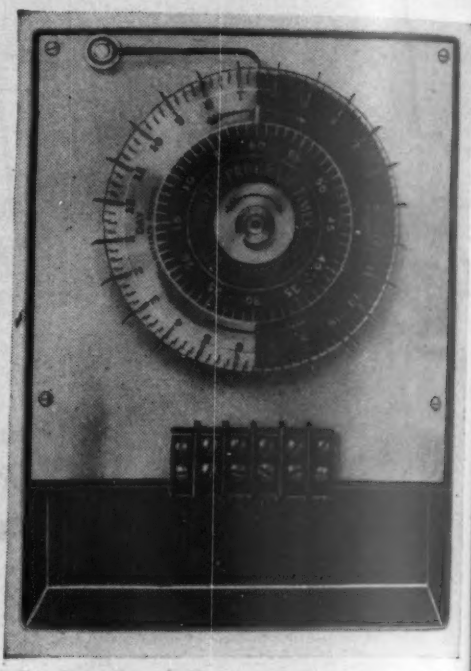
vinyl resins, plasticizers, stabilizers, pigments, and colors, the material is produced in a variety of gages. A vinyl cove base for use with the flooring can be extruded in long lengths. Neither moisture nor alkalis are said to be injurious to the flooring. Can be installed in strip or tile form, its thermoplastic characteristic permitting it to flow around corners and other indentations without cracking. An electrically controlled flooring heater will heat the entire lap area to form seams. Chemical Products Div., The Goodyear Tire & Rubber Co., Akron.

PROGRAM TIMER

Type P-15-24 program timer can be set to sound a bell or other signal at 15-min. intervals for 24 hours a day. Can be automatically set by turning the min-



ute hand, as with an ordinary clock. Circuit closure will give signal from 2 to 60 seconds long, as desired. Suitable where start- and stop-work signals are needed, or for controlling record players. Zenith Electric Co., 152 West Walton St., Chicago 10.

HYDRAULIC PUMP

Model J adjustable volume vane type oil hydraulic pump can be installed in an area 6x6 inches. At 1000-lb. pressure, it is said to maintain a volumetric efficiency of 90 per cent. Volumetric output is controlled by a mechanical movement of the rotor ring. Horsepower requirements may be computed for any

given installation according to

VISUAL EFFICIENCY

FIRST STEP TO SAFETY

The Bausch & Lomb Industrial Vision Service offers a proved fact-finding method for accident reduction through scientific visual classification

WHAT are the characteristics which distinguish accident-prone workers from those with perfect safety records? Industrial psychologists have set up correlations on the basis of many physical and mental capacities. One of the most dependable and easy-to-prove is *visual performance.*

The Bausch & Lomb Industrial Vision Service is the result of more than eight years of scientific research in industry, under the auspices of the Industrial Vision Institute of Purdue University. It is an easily-administered system which can be installed in your plant. By scientific methods, the visual skills of employees are measured. From factual data secured, visual standards are determined for each job. Against these standards are compared the visual skills of present and prospective employees. Those failing to meet the standards are recommended for professional eye care.

The results, proved in dozens of plants in many industries, are lowered accident records, increased production per worker, improved quality, lower training costs and less labor turnover. Wouldn't you like to be able to recommend a program with these advantages for your plant?

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CLEANS ANY FACTORY FLOOR IN 1 FAST, EASY OPERATION!

It's a fact! *Traffic-packed grime . . . incrusted grease, dirt and metal cuttings . . . rubbery layers of dried paint . . . granite-hard blobs of spilled concrete*—in fact *any* kind of soilage on floors can be whisked off in minutes with a Tennant Floor Machine.

Expressly designed for tough jobs that usually take hours or days of tedious hand scraping, the self-propelled Tennant Machine cleans any floor in one operation. And it's an easy one-man job. There's no scraping, no messing with water or chemicals, no "sweeping up" to do.

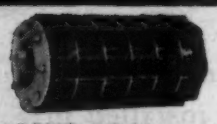
Dirt is cut loose with fast-cutting drum type steel wire brush or Revo-tool, then hurled into built-in soilage hopper; lighter dust is sucked into vacuum bag. Action of high speed 12" or 16" brush smooths and levels floor surface.

Result: a smooth, clean, *dry* floor—ready for immediate traffic.

6 TYPICAL ADVANTAGES

1. **REQUIRES ONLY 1 MAN.**
2. **CUTS CLEANING COSTS as much as 50%.**
3. **DRY CLEANS; no messy chemicals or water.**
4. **REDUCES HAZARDS; keeps floor dry, smooth.**
5. **CLEANS ANYWHERE; doesn't halt plant operation.**
6. **IDEAL FOR ANY TYPE of shop floor.**

TENNANT machines are available with electric or gasoline motors.



NEW REVO-TOOL . . . 9,856 *Impacts Per Second!*

Has hundreds of drum-mounted alloy-steel cutters to provide a scarifying and pulverizing action for cleaning and leveling floors. High speed hammer-mill action removes grease, tar, chips, paint, cement.

STEEL WIRE BRUSH

Contains twisted tufts of strong steel wire (20, 30 & 39 gauge) mounted in diagonal pattern—won't clog nor streak. Brush is reversible for self-sharpening. Excellent for average soilage. Revolves at 1760 RPM.

WRITE or WIRE TODAY for a FREE inspection of your floors. There is a TENNANT factory representative in your vicinity.

The way to finer floors
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Floor Maintenance System

G. H. TENNANT CO.

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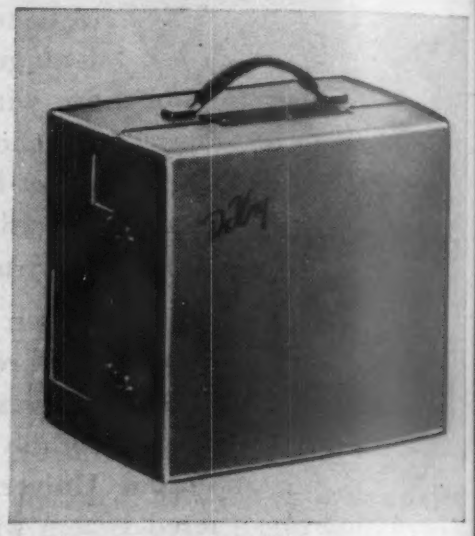
given installation according to volume and pressure needed. Vanes of special steel are self-compensating for wear. Rotor shaft is mounted in anti-friction bearings. The self-lubricated pump is available with foot or flange mounting. Racine Tool & Machine Co., Hydraulic Div., Racine, Wis.

CHANGE IN NAME

Robertshaw Thermostat Co., of Youngwood, Pa., The Fulton Sylphon Co., of Knoxville, Tenn., and the Bridgeport Thermostat Co., Inc., have been merged to operate under the name of Robertshaw-Fulton Controls Co., Knoxville, Tenn. This consolidation was effected to integrate the development, manufacture, and merchandising of a complete line of automatic temperature controls.

SOUND PROJECTOR

Named Bantam, a 16-mm. projector incorporates projection mechanism, soundhead, amplifier, speaker, and screen in one small case weighing less than 31



pounds. Has 750- to 1000-watt illumination for large pictures in auditoriums. Sound filtering system eliminates perceptible flutter and wows. Can be operated by an inexperienced person. Automatic loop setter permits resetting the lower loop without damage to the film when loop is lost because of faulty film or incorrect threading. Unit includes sound and silent projection, 2000-ft. film capacity, all controls on one illuminated panel, fast, safe motor rewinding of film without changing reels, cool operation one-point lubrication, and other features. DeVry Corp., 1111 Armitage Ave., Chicago 14.

CONTROL VALVE

Microflo control valve with spline plug can handle flows in c.c.'s with pressure drops in thousands of pounds. Basic element is a solid stellite valve plug, which is a honed fit in a solid stellite seat. Clearances between plug and seat cannot be measured by ordinary methods, maker says, yet galling does not occur because of the type of metal used. Flow control section of spline plug is ¼-in. O.D. by 1⅝ inch long. It

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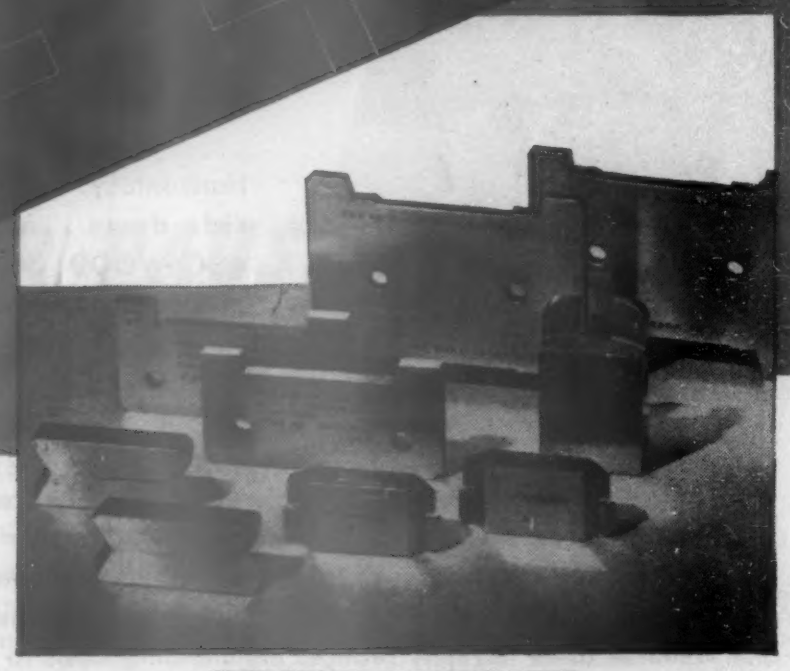
FLAT GROUND STOCK



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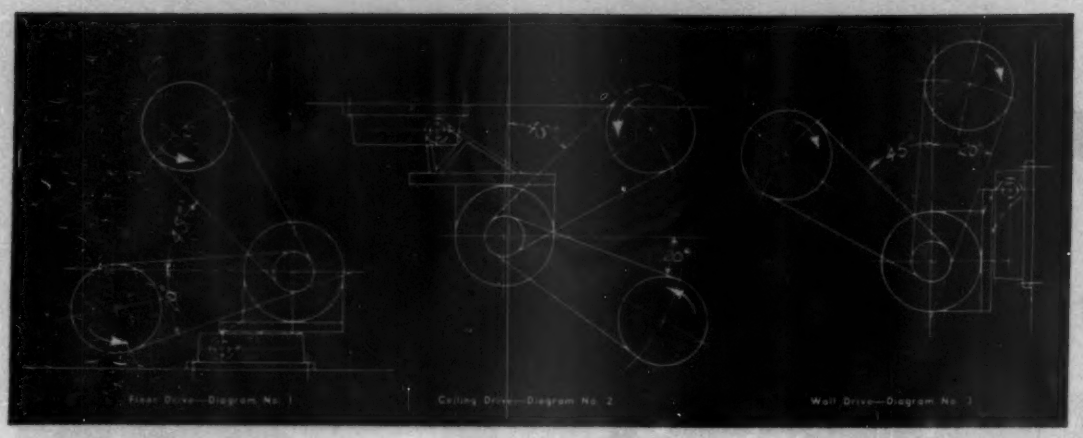

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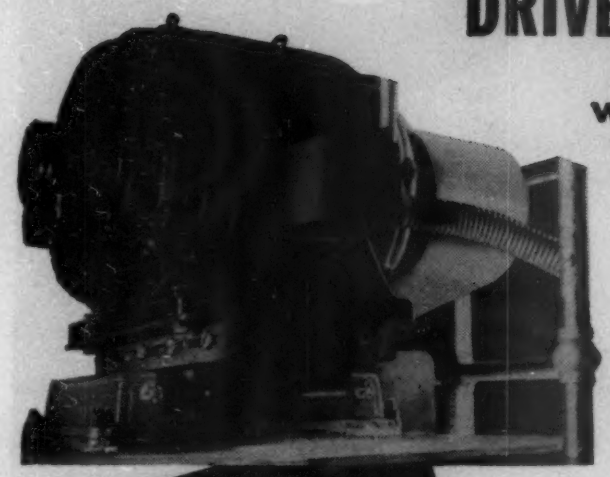
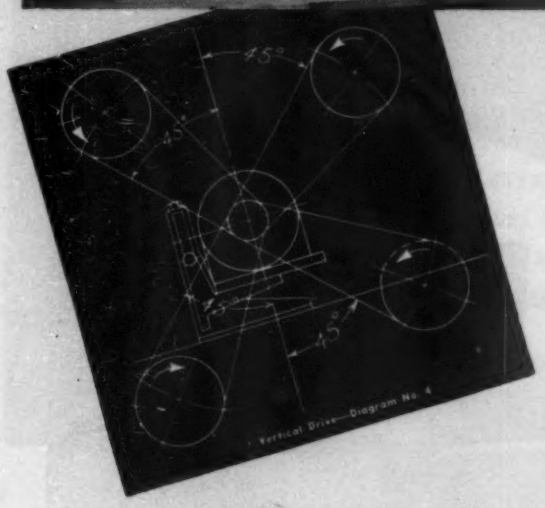
with *Tannate-Rockwood*





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Automatic tension adjusting features lengthen belt and bearing life, reduces shutdowns for belt center adjustment. TANNATE Leather Belt requires fewer take-ups and less maintenance, resists high temperatures, water, machine oil and many chemicals. This reliable drive not only reduces maintenance costs to a minimum, but provides more delivered power, lower power costs and maximum performance under any load condition.

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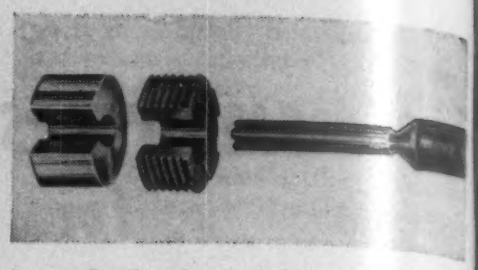
RHOADS *Tannate-Rockwood* SHORT CENTER DRIVE



is a selective lapped fit in a ⅝-in. deep seat. Flow control in the 1-in. valve travel is governed by the shape of slots or grooves milled into the plug surface. The valves can be supplied in ½-, ¾-, or 1-in. sizes. There are 15 interchangeable valve plugs for seats numbered 1 through 15. The valves can be ground for tight shutoff. Hammel-Dahl Co., 243 Richmond St., Providence 3, R. I.

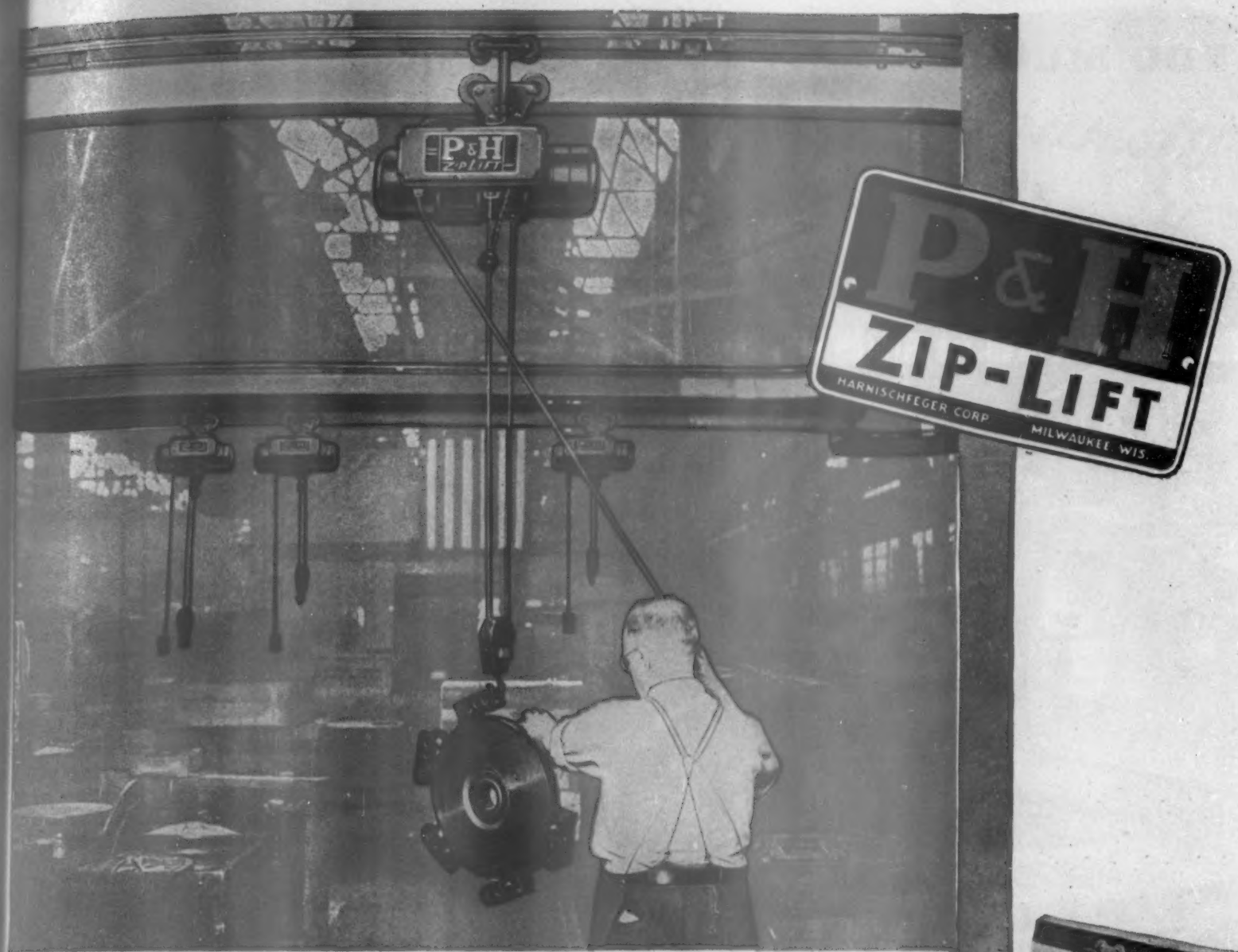
VACUUM CLEANER

Said to be virtually noiseless, heavy-duty industrial vacuum cleaner Model VA 20 is equipped for wet or dry pick-up. As a dry vacuum, it takes care of the dust and work clean-up, and is used

for wet pick-up in scrubbing and rug shampoo operations. Eighteen attachments and accessories are included. The two-stage fan is mounted below the motor to eliminate much of the sound. Includes a 115-volt grease-sealed motor operated on either a.c. or d.c., 0 to 60 cycles. Weighs 45 pounds, 65 with attachments. It rolls on three solid rubber casters. Hose is 1½-in. reinforced rubber. Machine is adaptable to either suction or blowing. Tank is 15-gal. capacity, built of heavy-gage metal. Inside is rust- and corrosion-proofed with rubber enamel. Holt Mfg. Co., 651 20th St., Oakland 12, Calif.

PLASTIC GOGGLE

Lightweight safety goggle features an all-plastic frame with a single plastic acetate lens designed for maximum vision. Named 607, the goggle is worn directly over eyes or over spectacles, for frontal protection against flying particles on machine work, hand tool operations, chemical and physical laboratory work, spot welding, and light grinding, chipping, and riveting. The brown plastic frame provides unob-



PRODUCTION NEVER PAUSES

when parts come THRU-THE-AIR!

No sooner is one part lowered into place than the next is on its way. Traveling "thru-the-air" via Zip-Lift Electric Hoist, it moves quickly and directly into position. And this with no effort by the operator save the mere pushing of buttons!

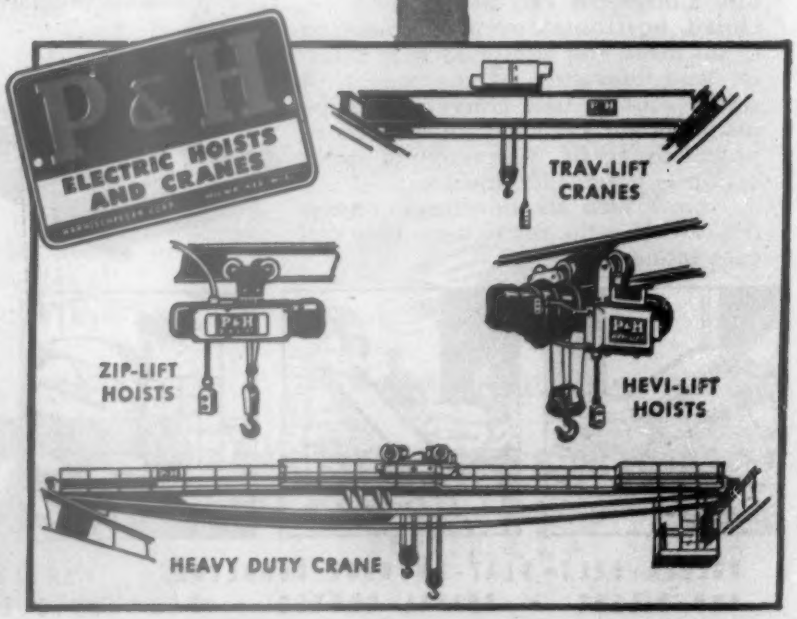
That's the beauty — and *economy* — of handling materials "thru-the-air." There's no waste effort, no delay, no loss of valued floor space. Best of all, "thru-the-air" handling lends itself to many different operations, even to carrying the load from the raw material stage right on through to the finished product!

Your inquiries are invited

Here's everything you want to know about P&H Zip-Lifts . . . applications, pictures, specifications. It's Bulletin H20-3—yours for the asking.

the "Extras" are standard equipment, added values on P&H Zip-Lift Hoists

- Shaved gears for lifetime service . . . all bearings grease-sealed.
- Motors specifically designed and built by P&H for hoist service — high starting torque, frequent reversal, etc.
- Effortless push-button control . . . equally effective on hook, jib, or trolley operation.
- Transformer provides 110 volts at the push button.



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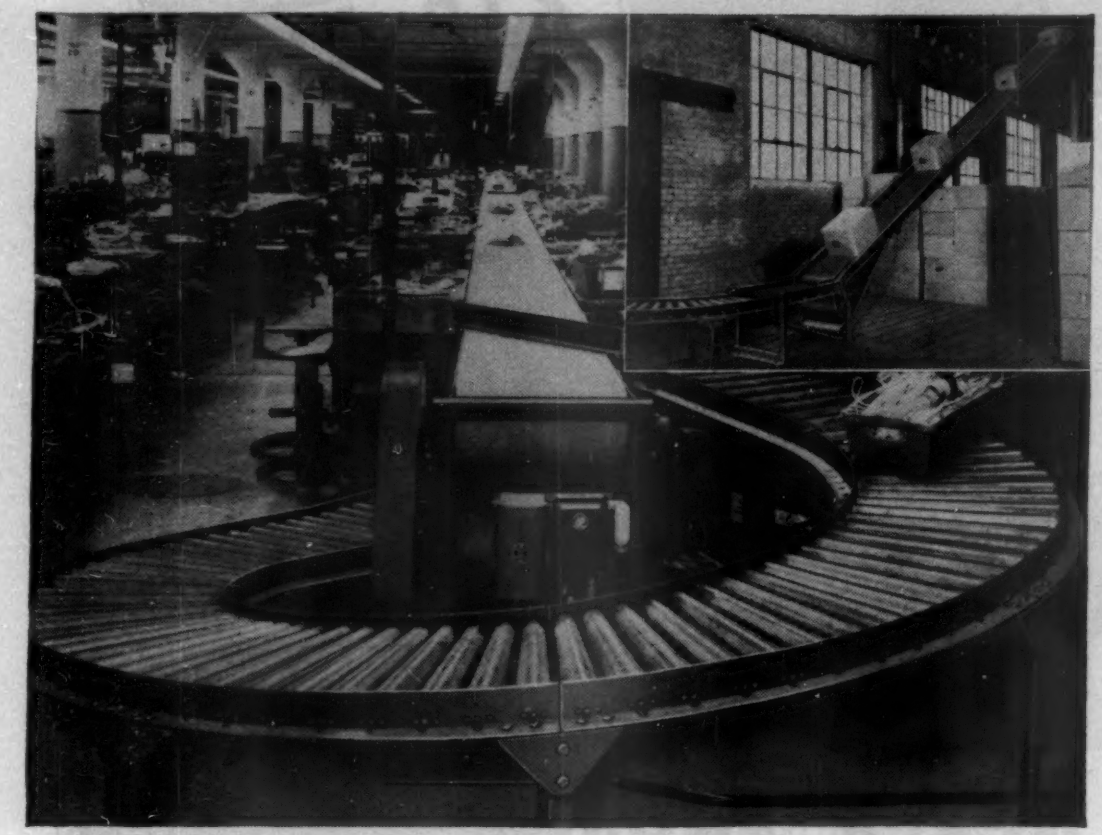

CONVEYORS may be the Answer ...Ask STANDARD CONVEYOR!

INVESTIGATE conveyors — belt conveyors for example. Belt conveyors are amazingly versatile. They handle small packages as easily as bulky crates—articles need not have a smooth bottom or surface as they do not "roll" but ride the belt. The belt itself may be stitched canvas, rubber, white woven, wire mesh or steel.

Speed of travel can be controlled to a few feet or a hundred per minute. Conveyors can be inclined, declined, horizontal or a combination of all three and equipped with transfer and elevating arrangements. A single unit of belt conveyor can be made longer than any other type of power conveyor. The range of application is practically limitless.

Look into all the things conveyors can do—the many ways they can earn money for you.

Standard Conveyor makes power and gravity conveyors in belt, roller, chain, and slat types; spiral chutes, inclined elevators, portable pilers, pneumatic tube systems. Write for Standard's valuable reference book FM-28 on conveyors and conveying methods.

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ROLLER - BELT - SLAT - PUSHBAR CONVEYORS • PORTABLE CONVEYORS AND PILERS • SPIRAL CHUTES • PNEUMATIC TUBE SYSTEMS

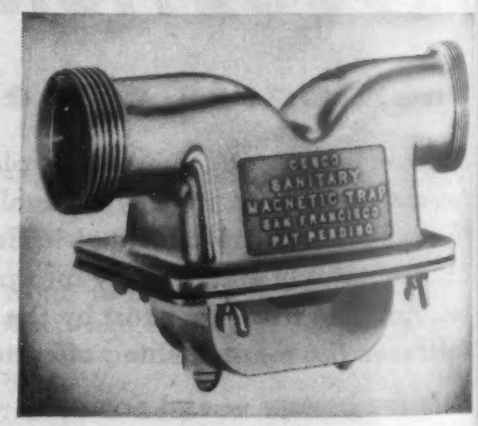
structed side vision. No metal touches the skin. The single lens is replaceable. The metal temples, enclosed in acetate to prevent corrosion, are adjustable. American Optical Co., Southbridge, Mass.

MASTER PULLER SET

A number of puller set-ups can be made for various jobs with Master Puller Set 4000AA. With the parts furnished, it is possible to assemble a slide hammer, light-duty, medium-duty, or heavy-duty puller. In addition, the set includes a wheel puller, blind bearing puller, single-jaw puller, and cap-screw cross-arm. The set has 42 items. Plomb Tool Co., 2209A Santa Fe Ave., Los Angeles.

MAGNETIC TRAP

Tramp iron can be removed from liquids with a magnetic trap designed to prevent damage to pumps and subsequent



stoppage of production lines. Non-electric, the trap requires no wires, rectifier, battery, or generator. Columbia Eng. Service Co., 593 Market St., San Francisco 5.

AMPLIDYNE CONTROL UNIT

Packaged amplidyne control unit is designed for use on steel and similar mill and processing line control applications where speed, current, or voltage regulation is required. The unit incorporates in one 18x12x11-in. package all the adjusting rheostats, capacitors, rectifiers, and instruments required for the amplidyne regulating circuit. In addition to regulating control circuits, the device provides motor speed limit control, field forcing during acceleration and decele-

It's the SIDES of a V-Belt

that GRIP the Pulley
Pick-Up the LOAD
and Really Get the WEAR!

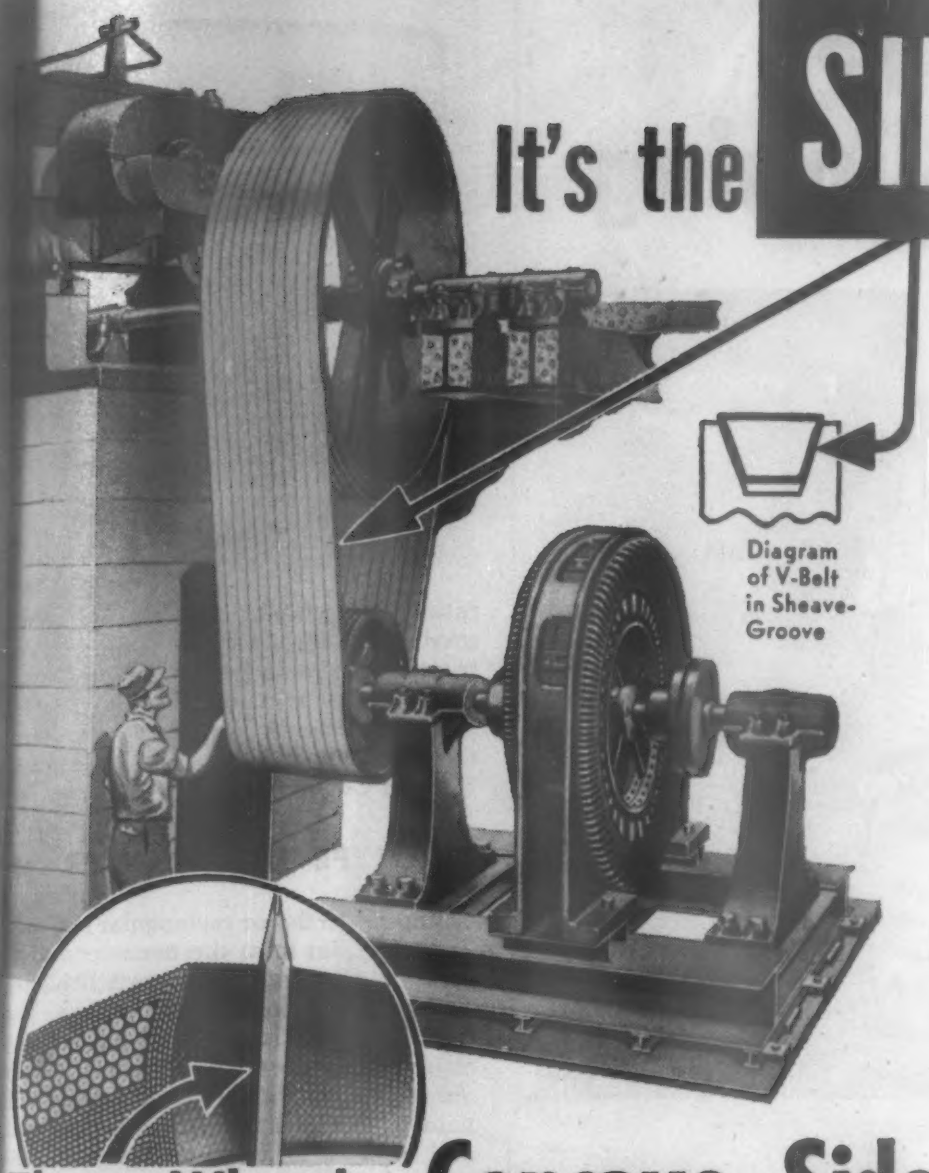


Diagram of V-Belt in Sheave-Groove

Every ounce of load a V-Belt carries must first be picked up by the sides of the belt. Clearly so, because only the sides come into contact with the pulley! The sides do all the GRIPPING on the pulley. The sides pick up the load. They transmit that load to the belt as a whole. And then, once more, the sides—and the sides alone—grip the driven pulley and deliver the power to it. Finally, the sides get ALL THE WEAR against the sheave-groove wall.

That is why you have always noticed that the sidewall of the ordinary V-Belt is the part that wears out first.

That's Why the Concave Side

(A GATES PATENT)

IS IMPORTANT TO YOU!

Clearly, since the sidewall is the part that wears out first, anything that prolongs the life of the sidewall will lengthen the life of the belt—and that's why the patented Concave Side is important to you.

The simple diagrams on the right show exactly why the ordinary, straight-sided V-Belt gets excessive wear along the middle of the sides. They show also why the Patented Concave Side greatly reduces sidewall wear in Gates Vulco Ropes. That is the simple reason why your Gates Vulco Ropes are giving you so much longer service than any straight-sided V-Belts can possibly give.

and the CONCAVE SIDE is more important NOW than ever before

Now that Gates SPECIALIZED Research has resulted in Super Vulco Ropes capable of carrying much heavier loads—fully 40% higher horsepower ratings—the sidewall of the belt is called upon to do even more work in transmitting these heavier loads to the pulley. Naturally, with heavier loading on the sidewall, the life-prolonging Concave Side is more important now than ever before!

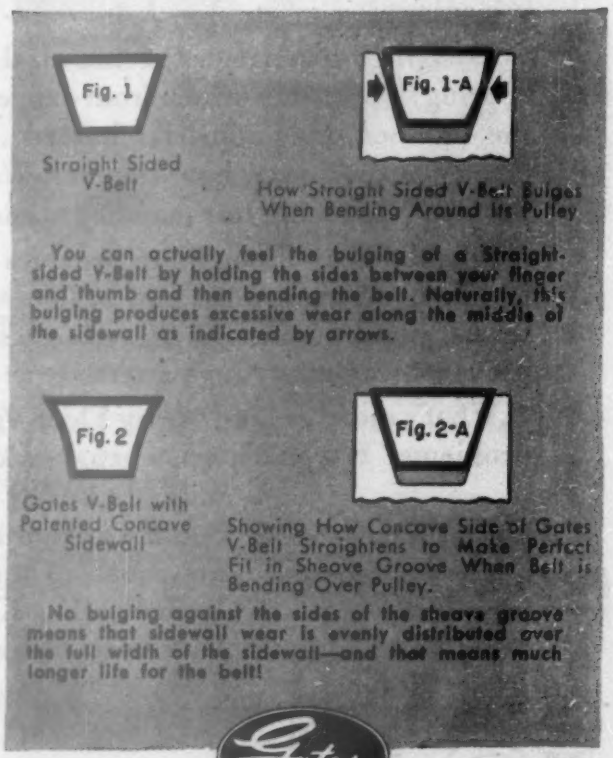


Fig. 1
Straight Sided V-Belt
Fig. 1-A
How Straight Sided V-Belt Bulges When Bending Around Its Pulley
You can actually feel the bulging of a Straight-sided V-Belt by holding the sides between your finger and thumb and then bending the belt. Naturally, this bulging produces excessive wear along the middle of the sidewall as indicated by arrows.
Fig. 2
Gates V-Belt with Patented Concave Sidewall
Fig. 2-A
Showing How Concave Side of Gates V-Belt Straightens to Make Perfect Fit in Sheave Groove When Belt is Bending Over Pulley.
No bulging against the sides of the sheave groove means that sidewall wear is evenly distributed over the full width of the sidewall—and that means much longer life for the belt!
Gates

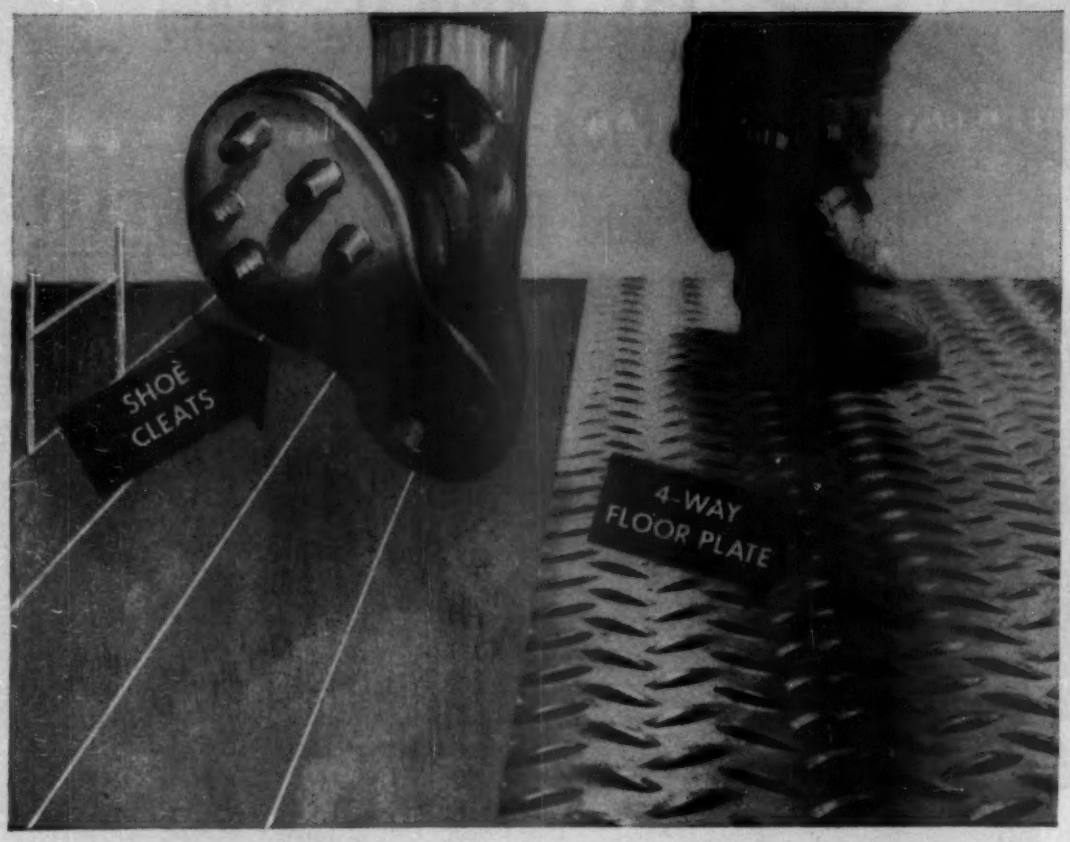
The Mark of SPECIALIZED Research

THE GATES RUBBER COMPANY
"The World's Largest Makers of V-Belts"
DENVER, U. S. A.

482

GATES VULCO ROPE DRIVES
Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

Two Ways to Prevent Slipping



Your employees won't need football shoes for sure footing if your plant is equipped with Inland 4-Way Floor Plate.

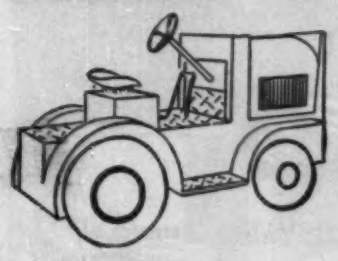
Farsighted management relies on this modern skid-resistant flooring to protect workers from dangerous accidents caused by the number one industrial hazard . . . slipping. It knows, through experience, how Inland 4-Way Floor Plate increases profits by reducing lost man-hours and costly damage suits.

Inland 4-Way Floor Plate provides built-in safety wherever feet or equipment must go . . . floors, walkways, ramps, platforms, steps. Its sure-grip traction results from Inland's plant-proven 4-way safety lug pattern.

What's more, Inland 4-Way Floor Plate reduces maintenance problems. It won't burn, warp, crack, splinter, or absorb liquids. INLAND STEEL COMPANY, 38 South Dearborn Street, Chicago 3, Illinois. Sales Offices: Davenport, Detroit, Indianapolis, Kansas City, Milwaukee, New York, St. Louis, St. Paul.

Write for Booklet

FOR YOUR PRODUCTS, TOO



INLAND STEEL

Use...

INLAND 4-WAY FLOOR PLATE

ration, and stabilizing functions. Uses small rheostats. Can be mounted on the front of the main panel board, recessed in the panel, or mounted back of board. All adjustments can be made with screwdriver. Control Div., General Electric Co., Schenectady 5.

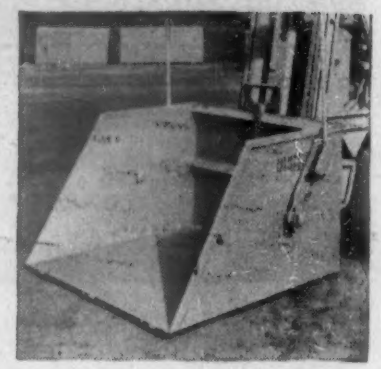
DIAL-TYPE THERMOMETER

Clamping on flat or rectangular surfaces, dial-type, flat stem thermometer can be used on power busbars, switch blades, engine blocks, and water jackets. The heat element is secured against the object under test, and presents a wide absorbing area. Ordinary *C* clamps will hold it, or it can be drilled and tapped, and screwed down in any position. The thermometer can be supplied in flat stems of varying widths, thicknesses, and lengths, in a range of metals. Standard capacities are 0–200, 50–500, 150–750, and 200–1000 deg. F. Three- and 5-in. dials are furnished, and Centigrade ranges are available. W. C. Dillon & Co., Inc., 5410 West Harrison St., Chicago 44.

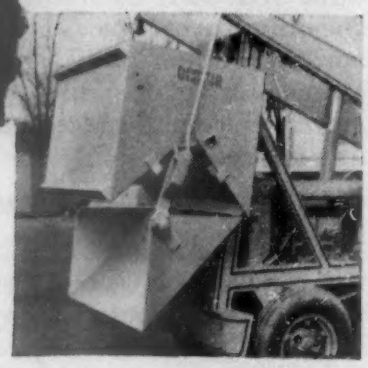
RUBBER WADER

Industrial rubber wader is suitable for use by workers in damp, wet, or muddy locations. The rubber construction has

Mister-
-Youve been Waiting for the "DID"



Above skip type body. Below drop bottom body. Note how bottom forms chute for material.



DEMPSTER DUMPSTER

Remarkably versatile and mobile, the new Dempster-Dumpster "DID" provides an efficient and economical intra-plant materials handling system applicable to nearly every industrial operation. With one hoisting unit handling many bodies, this system is ideal for shifting material from point to point in plant and yard operations. On each trip, up to 2500 pounds of material can be picked up and carried inside the plant from yard stockpiles. Ashes or waste can be carried outside, dumped into a bin or truck body not exceeding 94 inches in height.

With the addition of an easily detachable boom extension, which can be elevated to a height of over 21 feet, the "DID" becomes a mobile crane capable of hundreds of tasks such as lifting pipe, scrap, light machinery, steel, etc.

Shown above is the Dempster-Dumpster Type "DID" Tractor Hoisting Unit dumping a tilt-type body. At left top, the tilt-type body is in carrying position, and below Hoisting Unit approaches body to make the pick-up which is accomplished without the driver leaving his seat.

Detachable bodies are made in many designs to suit any need. Photos at right above show, for example, two other standard types. Write today for completely illustrated literature on this remarkable new Dempster development.

DEMPSTER BROTHERS, Inc.

428 Springdale, Knoxville 17, Tenn.

Acme Silverstitcher Reduces Carton Costs

Read how eastern packer of choice tomatoes cuts carton costs by $10 per 1000 with Acme Silverstitcher

Due to limited space, this packer used to buy preformed telescope cartons in comparatively small quantities. Then he told his problem to an Acme Shipping Specialist.

Now, he buys scored blanks, does his own stitching, and speedily turns out cartons according to his daily needs. A large number of blanks can be stored in a small space and used as required.

Double Savings—Space and Money!

With an Acme Silverstitcher, this packer saves one cent on each of thousands of cartons. Even with limited storage space, he now can make good "buys" on carton blanks and be certain of always having cartons when he needs them.

Your shipping room may be a good place to start saving money . . . you may be able to get better shipping at lower cost. Why not call in an Acme Shipping Specialist for suggestions? There's no obligation.

Send the coupon for further information, or write direct for help on your specific problem.

ACME STEEL COMPANY
NEW YORK 7 ATLANTA
CHICAGO 8 LOS ANGELES 11

Grade "A" Shipping for Choice Tomatoes with an Acme Silverstitcher. They're packed in cartons on which the shipper now saves $10 per thousand. Easily spoiled and very vulnerable to bruises, these choice tomatoes reach stores and customers in perfect condition.

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2838 Archer Avenue
Chicago 8, Illinois
Please send me your free booklet describing Acme Silverstitchers and their applications.

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Company.....

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City.....Zone.....State.....

ACME & MORRISON Silver Stitchers
REG U S PAT OFF

AND SILVERSTITCH BOX-STITCHING WIRE

maximum abrasion resistance, ma... says, and all seams are cemented a... strapped, and crotch seam is rubbe... reinforced. The wader is made in o... pattern, with shoe sizes from 8 to ... Boots have a cleated sole and mold... heel. The rubber suspender straps a... equipped with buckles, and a bib fro... is provided for extra height. Strengthe... ing rivets are employed at tension point... The B. F. Goodrich Co., Akron, Ohio.

CORROSION INHIBITOR

Heavier than water, Tank Saver pene... trates the oil directly to the bottom o... the tank. Mixes with water, neutral... izing any acid. It is said to cover the... metal with an air-tight film which pre... vents oxygen from touching the meta... thereby stopping the rust. Has a clarify... ing action on most oils. Sudbury Lab... oratory, South Sudbury, Mass.

A.C. WELDERS

Line of a.c. welders includes models for... 200, 300, and 400 amps. and for 130 and... 180 amps. All are NEMA rated. Patented... electric and magnetic circuits are said... to effect instant starting, smooth and...

stable. Design also produces high power factor, and reduces no-load losses. The movable core on all models travels less than 1 inch to cover the range of stepless amperage control. The arrangement of dual primary and secondary coils, and the elimination of arc boosters, reactor coils, and fans contribute to the compact construction. Air passages are provided around coils and cores. Carriages are welded steel tubing, and are equipped with large-diameter, wide-rim, cast-aluminum wheels. John A. Kern Co., 224 (30) North Loomis St., Chicago 7.

BELT CONVEYOR BOOSTER

Known as Styl-O-Veyor, a portable belt conveyor booster can be fed or discharged from either end. Angle or

The simplicity, accessibility and compactness of the Joy Fan is clearly shown in this cut-out drawing.

"SERIES 1000"
JOY AXIVANE FANS

TROLLER DESIGNED

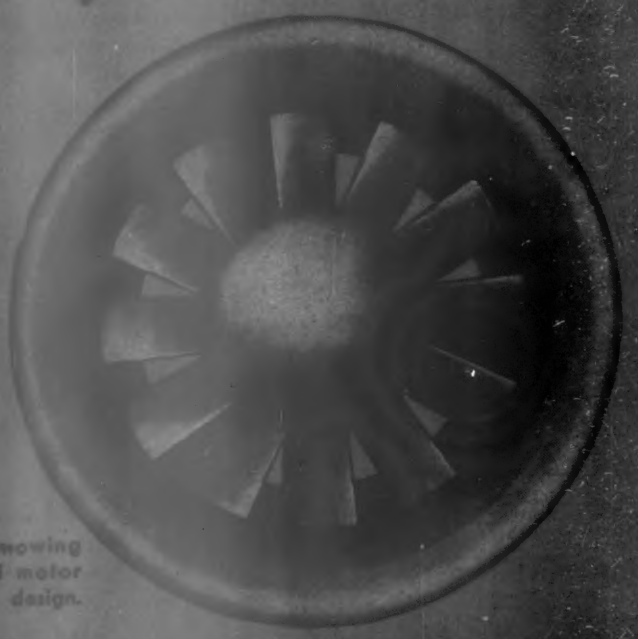
More efficient—lighter—more compact—easily and economically installed.

A very complete line of stock Vaneaxial fans in sizes and capacities to cover practically any industrial need.

Volumes up to 100,000 C.F.M.
Pressures up to 9.6" W. G.
Housing diameters 18" to 60".

Compact—easier to install—efficient—with an exclusive Joy feature, on-the-job adjustable Blades, permitting change of pressures and correction of duct resistance.

Write for Bulletin describing the "Series 1000" line—now ready!



Front view, showing self-enclosed motor and clean-cut design.

Call for a Joy Engineer

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

Specify SARANAC *Stapled* Packages---

They're STRONGER

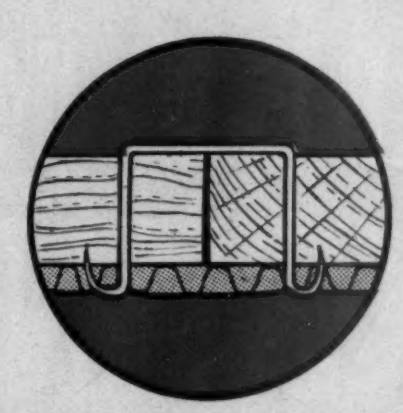
REDUCE DAMAGE IN TRANSIT

Packages that get your products to their destination in perfect condition—just as they left your own shipping platform—are excellent insurance for customer satisfaction. Damage in transit is often settled between carrier and consignee without notifying the shipper. But annoyance, inconvenience, and delay are often reflected on your product.

SARANAC *Stapled* packages protect your product from handling damage because stapled fastenings are extra secure. The staple's two-leg shape presents extra friction surface for extra holding power. There are two points to clinch—and SARANAC machines make a hook-clinch that is far stronger than a bent-over nail. U-shaped top holds when applied to the ends of thin crating where nail heads frequently pull through. Staples are cut to exact length for the job, driven, and hook-clinched back into the crating by SARANAC machines faster than ordinary nailing machines can drive. This extra speed means lower packaging costs for you—plus extra package security.

Ask your supplier for SARANAC *Stapled* packages.

Shipping container for refrigerator made of corrugated board stapled to cleated frame.



Cross-section showing staples used to join cleats at corners and intermediate points.

Cross-section showing staples used to fasten panel of plywood or corrugated board to cleats.

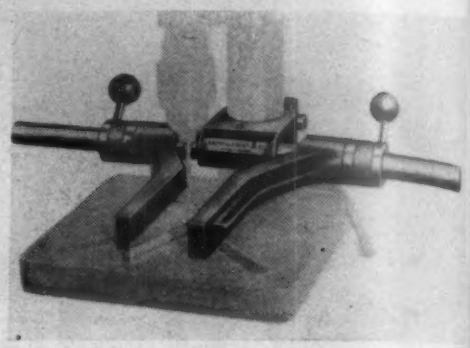
SARANAC MACHINE CO.

BENTON HARBOR • MICHIGAN

height is adjusted by hydraulic power. Width of the unit inset is 16½ and 26½ inches. Length is 20 feet, vertical adjustment at center, 24 inches; minimum feed elevation, 12 inches; maximum feed elevation, 36 inches; and maximum discharge elevation, 10 feet 6 inches at 25 degrees. Has 3-ply rubber Ruff-top belt. A ¾-hp. electric motor is the driving unit. Belt speed is 60 f.p.m. Conveyor operates on four 6-in. swivel ball-bearing casters. Has two floor locks and pushbutton *off-and-on* switch. Island Equipment Corp., 101 Park Ave., New York 17.

DRILL PRESS WORK HOLDER

Safety work-holder clamps to the column of any small standard drill press, securing the work with a quarter-turn of a lever. The tool can substitute for



simple drill jigs, bolts, and C-clamps. The clamping arms are adjustable along the length of the cross-arm to encompass the full width of the drill press table, and are swung back to clear a drill jig or machine vise when necessary. Standard sizes fit drill presses with columns of 1⅝-, 2¼-, 2¾-, 3-, 3½-, 3¾-, or 4-in. diameters. Universal Vise & Tool Co., Parma, Mich.

GATE VALVE

Incorporating full cylindrical body sections, bronze gate valves, Fig. 2228, provide maximum distortion resistance. The 200-lb. S. P. bronze, double disk, "Union Bonnet" gate valve has rising stem and screwed ends. A companion valve, Fig. 2229, is the flange end pattern, rated at 150-lb. S. P. Made in ¼- to 3-in. sizes. Features claimed by the manufacturer are a patented silicon alloy stem material that eliminates stem-thread failures; hexagon head gland; and beveled disk wing guides and body guide channels to facilitate assembly when servicing the valve. The Lunkenheimer Co., P. O. Box 360 Annex Sta., Cincinnati 14.

ACID-RESISTANT BRUSH

Designed for applying acids in cleaning operations, acid-resistant brush is made with a tuft of FybRglass embedded in a wood handle. When wet, the bristles become soft and pliable. The brush may be used in any acid that does not affect glass, such as nitric acid, soldering fluxes, chromic acid, and chloride of iron. The standard size measures 3 inches in width,

There's Truth in this "Tall Story"

IF YOU THINK of *all valves* in this plant as *one valve*, you'll see the truth in this trick photo. Valves, collectively, represent one of the biggest investments in equipment in any plant.

That's why, with wages and material costs higher than ever before, it is just as important to keep a sharp eye on valve maintenance as it is on operating costs of larger plant units.

EXCESSIVE MAINTENANCE of one inferior valve is insignificant, but, multiplied by thousands, it becomes a serious drain on operating budgets.

JENKINS BROS. helps you meet this problem two ways. First, by building extra endurance into Jenkins Valves, making them the longest-lasting, lowest-upkeep valves that money can buy. Second, with advice from Jenkins Engineers on any question of proper selection, installation, or maintenance.

For all new installations, for all replacements, rely on Jenkins quality and engineering service for lowest valve costs in the long run. *Sold through leading Industrial Distributors everywhere.*

Jenkins Bros., 80 White St., New York 13;
Bridgeport, Conn.; Atlanta; Boston;
Philadelphia; Chicago; San Francisco.
Jenkins Bros., Ltd., Montreal.

"PREVENT VALVE FAILURE" is a 28-page guide to valve economy, fully illustrated, with case histories of valve damage, and recommendations for its prevention by proper selection, installation, inspection, and maintenance. FREE on request. Write JENKINS BROS., 80 White St., New York 13, N. Y.

LOOK FOR THIS DIAMOND MARK

SINCE Jenkins Bros 1864

JENKINS VALVES

Types, Sizes, Pressures, Metals for Every Need

Typical "HEADACHE" Job

—until this Detroit paint manufacturer solved it with a ROSS Lift Truck

Moving and storing 800-pound drums of paint may not be spectacular work. But handling them in quantity was a back-breaking, space-wasting job that caused a lot of headaches before Rinshed-Mason Company put this ROSS LIFT TRUCK to work. It's typical of the many handling jobs which almost every plant has to contend with—jobs which a ROSS with its all-weather, all-surface performance will handle a lot better and a lot faster.

A survey of almost any plant will show up many places where hundreds of man-hours could be saved for productive work through the use of ROSS Heavy Duty LIFT TRUCKS. Six models, capacities 5,000 to 18,000 pounds. Hydraulic hoist, gasoline power, pneumatic tires.

Rely On ROSS

THE ROSS CARRIER CO.

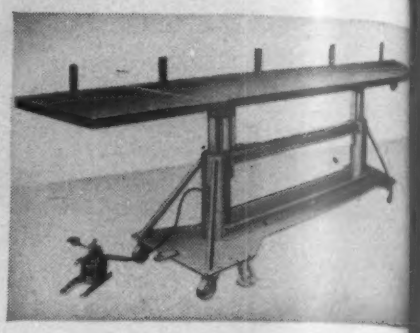
295 MILLER STREET, BENTON HARBOR, MICHIGAN, U.S.A.

Direct Factory Branches and Distributors Throughout the World

⅜ inch in thickness, and has bristles tending 2½ inches from the ba Other sizes may be obtained. The Fo Co., Inc., 104 South State St., Syra

SHEET-FEEDING TABLES

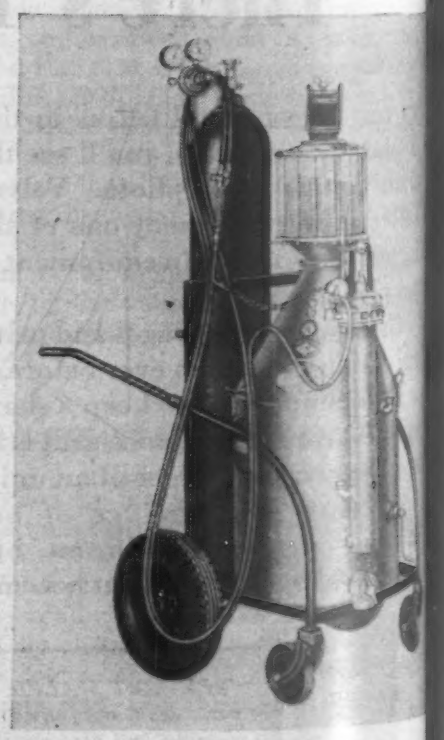
With 4000- and 6000-lb. capacities, draulic sheet-feeding tables are ma a synchronized dual pedestal de Have standard base sizes, on which



be fastened tops of various widths accommodate the desired sizes of sh or strips. A 30-deg. tilt top is optio The single-speed hydraulic foot pu with 5 feet of flexible hose, permits creasing the elevation from 24 to inches. The table is fitted with heavy-duty swivel casters and heavy-duty rigid casters. A floor l secures the table in feeding posi Lyon-Raymond Corp., 4358 Madison Greene, N. Y.

ACETYLENE GENERATORS

Redesigned 14ND carbide acetyl generators are said to feature lig weight, and increased portability safety. The visible supply hopper



MISSISSIPPI RIVER MUD is this valve's regular diet

Raw, silt-laden Mississippi River water at 175 p.s.i. had quickly destroyed conventional type valves through abrasive action and corrosion of exposed working parts in Union Electric Company's Venice, Illinois Plant. Then, their own engineers and Stone & Webster Engineering Corporation selected Grinnell-Saunders Diaphragm Valves. These flanged, unlined valves with rubber diaphragms have already served several times longer than previous valves, and are still going strong.

YOU, too, may find your answer to valve troubles due to corrosion, contamination or suspended solids, in

GRINNELL-SAUNDERS DIAPHRAGM VALVES

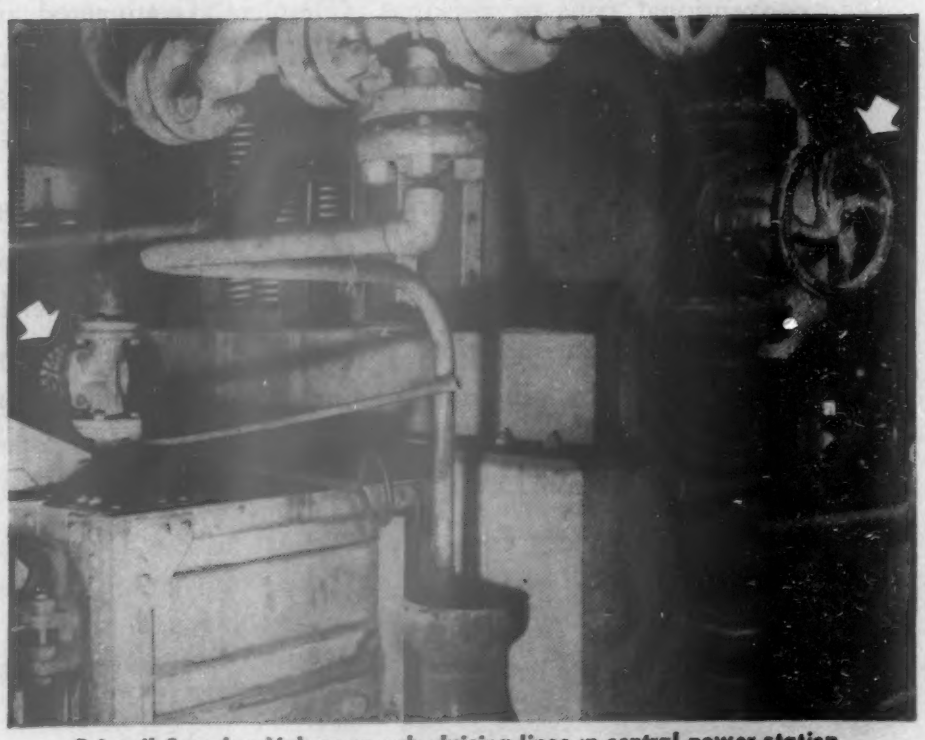
ISOLATED WORKING PARTS — The flexible diaphragm isolates working parts of the valve from the fluid, preventing contamination or corrosion.

CORROSION-PROOF LININGS — A selection of diaphragm materials and also body linings of glass, porcelain, lead, rubber or synthetics to suit your service requirements.

STREAMLINED FLOW . . . POSITIVE CLOSURE — Streamlined passage without pockets minimizes friction. Large area of contact of the diaphragm, plus diaphragm resilience, permit positive closure even when solids are trapped.

Write for catalog—Grinnell-Saunders Diaphragm Valves.

GRINNELL COMPANY, INC.
Providence 1, R. I.



Grinnell-Saunders Valves on ash sluicing lines in central power station.

BRANCH WAREHOUSES

Atlanta 2, Ga.	Kansas City 16, Mo.	Philadelphia 34, Pa.
Charlotte 1, N. C.	Long Beach 10, Cal.	Sacramento 14, Cal.
Chicago 9, Ill.	Los Angeles 13, Cal.	St. Louis 10, Mo.
Cleveland 14, O.	Milwaukee 3, Wis.	St. Paul, Minn.
Cranston 7, R. I.	Minneapolis 15, Minn.	San Francisco 7, Cal.
Fresno 1, Cal.	New York 17, N. Y.	Seattle 1, Wash.
Houston 1, Tex.	Oakland 7, Cal.	Spokane, Wash.

GRINNELL
WHENEVER PIPING IS INVOLVED

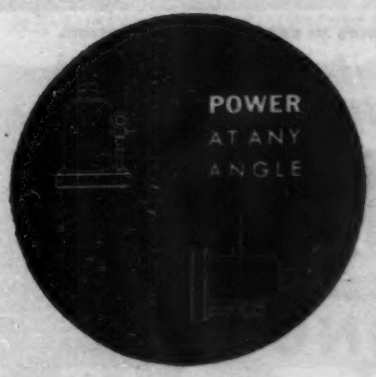
BETTER PERFORMANCE STARTS AT THE HEART OF A HEIN-WERNER JACK

The "heart" of a Hein-Werner Hydraulic Jack is its Heinite Piston, proven by actual tests to withstand ten times the wear of conventional cups or packings. Completely engineered and manufactured in our own plant, the exclusive Heinite Piston is your guarantee of maximum operating efficiency in every Hein-Werner Hydraulic Jack.

FOR APPLICATIONS IN YOUR PLANT REQUIRING UP TO 100 TONS PRESSURE!

Industrial plants have found many time and labor-saving uses for Hein-Werner Hydraulic Jacks. For maintenance, conversion or production line operations, these hydraulic jacks are efficient for pressing gears, pinions or bushings—or for helping to shift heavy machinery, move heavy stock, or other load-lifting operations up to 100 tons. Every Hein-Werner Jack is tested at 1½ times its rated capacity.

Made in models of 1½, 3, 5, 8, 12, 20, 30, 50 and 100 tons capacity. See your industrial supply distributor or write us.



Hein-Werner
HYDRAULIC JACKS

HEIN-WERNER CORPORATION
WAUKESHA • WISCONSIN

been reduced in weight by use of steel stampings. The trucks have pneumatic rubber tires. The safety check is designed to stop all flashbacks which come from improper operation of the torch. The Model PS generators are available in four sizes. The 6-PS, 30 cu. ft. per charge; the 12-PS, 60 cu. ft. per charge; the 25-PS, 125 cu. ft. per charge; and the 50-PS, 250 cu. ft. per charge. Sight Feed Generator Co., Richmond, Ind.

PARTS CLEANER

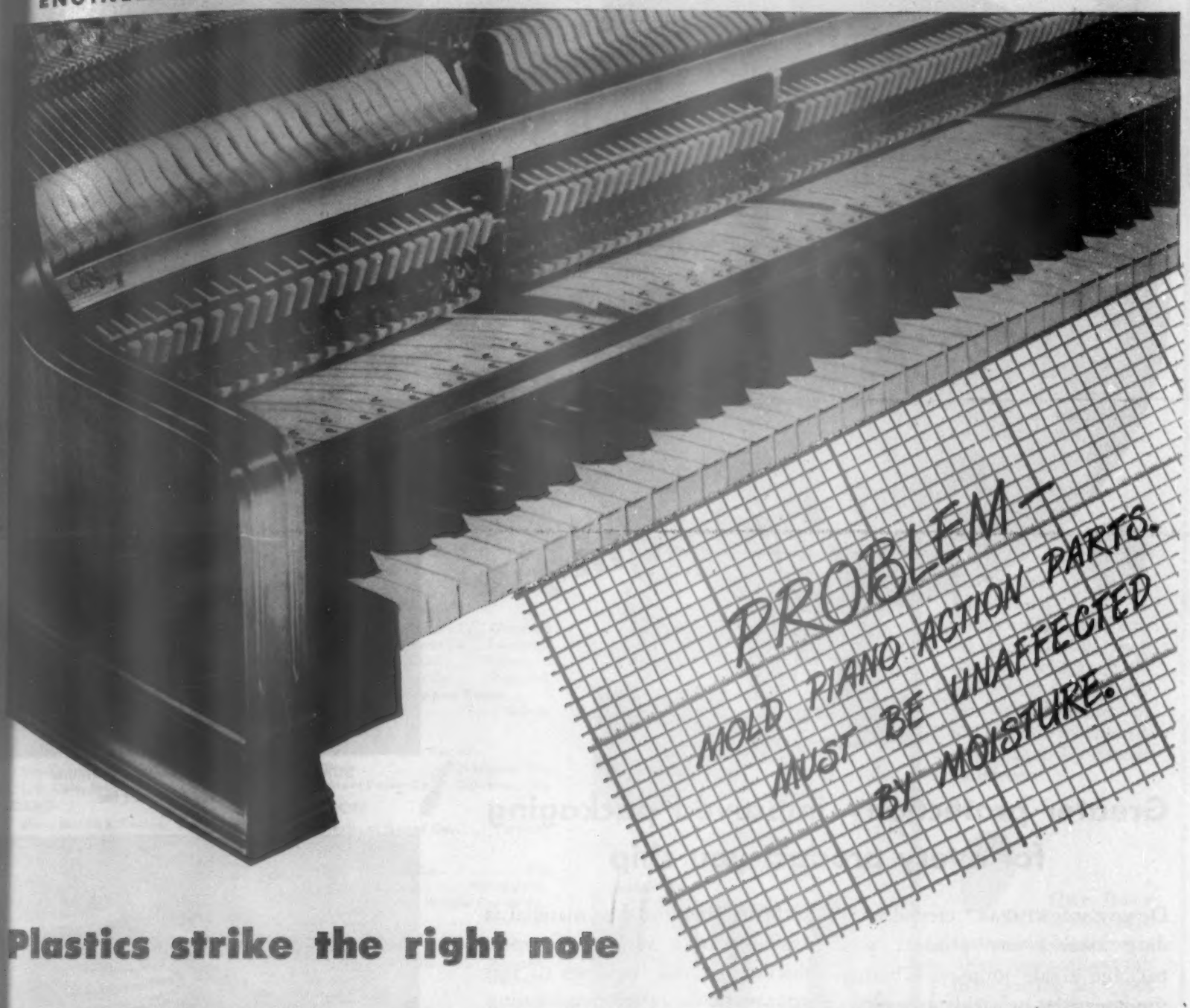
Siloo parts cleaner is said to remove sludge, grease, carbon, and dirt deposits from metal surfaces. Fast-acting and economical to use, according to the manufacturer, it is a single-phase material—contains no aqueous matter. Can be brushed, pumped, or sprayed. Claimed to be non-corrosive, non-volatile, and non-flammable. Petroleum Solvents Corp., 331 Madison Ave., New York 17.

BANDSAW

Made in direct-motor-drive and V-belt-drive models, bandsaw taking blades up to 1 inch in width has a capacity of 13¼ inches under the top guide. Aluminum

wheels, balanced to reduce vibration, and mounted in permanently sealed ball bearings, have minimum momentum when the power is cut off. They are stopped with the foot brake on the lower wheel. An adjustment control on upper wheel keeps the blade at proper tension, which is indicated on the scale. Supported by two trunnions, 17 inches apart, the 20x24-in. table tilts and locks at angles up to 12 degrees to the left, and 45 to the right. A miter gage slot on the table is supplied, while a rip fence can be added. A dust chute, which can be attached to a dust collector, carries away dust and chips. Delta Mfg. Div., Rockwell Mfg. Co., 600 East Vienna Ave., Milwaukee 1.

ENGINEERED IN PLASTICS BY GENERAL ELECTRIC



Plastics strike the right note

● Now it's plastics for pianos! Plastics parts for piano actions, molded by General Electric for Pratt, Read & Co., Inc., are reported in a magazine article to represent "one of the greatest innovations in the piano industry in a century." For this application, G.E. selected a durable plastic material (ethyl-cellulose) that is unaffected by moisture or weather. The uniformity and stability of the plastics parts help assure true tone and keys that never stick. Moreover, the use of plastics speeded and simplified Pratt, Read's assembly process.

Whether *your* plastics job is "something special"—or an ordinary one—you can benefit by General Electric's *complete* plastics service. G.E. can carry your plans from drawing board to delivery platform—design, engineer and mold plastics parts to meet your own individual requirements.

If You Have a Plastics Problem—General Electric has the answer. General Electric design and production "know-how" can reduce your costs, improve your product. For more details, call your nearest G-E Sales Office. Or write for information and your free copy of the interesting, full-color booklet, "Problems and Solutions in Plastics," to Plastics Division, Chemical Department, General Electric Company, 1 Plastics Avenue, Pittsfield, Massachusetts.

G-E COMPLETE SERVICE—AT NO. 1 PLASTICS AVENUE

Backed by 53 years of experience. We've been designing and manufacturing plastics products since 1894. General Electric research facilities have expanded continually, working to develop new materials, new processes, new applications for plastics parts.

No. 1 Plastics Avenue—complete plastics service—engineering, design, mold-making. G-E industrial designers work with our engineers to create plastics parts, sound and good looking. Skilled mold-makers in G-E toolrooms average over 13 years experience.

All types of plastics. Compression, injection, transfer and cold mold facilities . . . high and low pressure laminating . . . fabricating. G-E Quality Control—a byword in industry, means as many as 160 inspections and analyses for a single plastics part.

GENERAL ELECTRIC

CD47-A89

General Electric plastics factories are located in Scranton, Pa., Meriden, Conn., Coshocton, Ohio, Decatur, Ill., Taunton and Pittsfield, Mass.

INSULATION PACKAGING—Hot Meals Aloft
Photo Courtesy United Air Lines

SURFACE PROTECTION—Water Heater
Photo Courtesy Hotpoint Inc.

Greater protection—improved packaging for every product you ship

Downy-soft KIMPAK* creped wadding assures any product you package a safe journey. Whether the item is as unwieldy as a metal window frame or fragile as a porcelain urn, dependable KIMPAK shields it from damage.

For KIMPAK is a compact, feather-light cushion. It's strong and flexible. Neat, clean and easy to handle. And KIMPAK is economical—adds little weight or bulk to packaging . . . cuts profit-killing shipment losses.

Soft, snow-white KIMPAK is made either liquid absorbent or liquid repellent—it's shock absorbent. This grit-free material is available in a variety of types, thicknesses and backings to suit your particular interior cushioning needs. In fact, there is a specification of KIMPAK to meet every requirement of the Four Basic Methods of Interior Packaging—Surface Protection, Blocking and Bracing, Flotation Packaging and Absorbent Packaging.

Free for you. The wonderful KIMPAK booklet on better ways to package your product. Merely ask your local KIMPAK distributor or if you desire write: Kimberly-Clark Corporation, Creped Wadding Division, Neenah, Wisconsin.

A PRODUCT OF Kimberly Clark RESEARCH

Kimpak

REG. U.S. PAT. OFF. & FOREIGN COUNTRIES

CREPED WADDING

*T. M. Reg. U. S. and Can. Pat. Off.

BLOCKING AND BRACING—Metal Window Frames
Photo Courtesy Flour City Ornamental Iron Co.

FLOTATION PACKAGING—Porcelain Urns
Photo Courtesy Chas. A. Stevens & Co.

Distributors of

Kimpak*

CREPED WADDING

CHECK THE ONE NEAREST YOU

(For a description of KIMPAK see advertisement on facing page)

ALABAMA
Graham Paper Co. . . . . Birmingham
ARIZONA
Graham Paper Co. . . . . Phoenix
CALIFORNIA
Blake, Moffitt & Towne . . . . . Fresno, Oakland, Sacramento, San Francisco, San Jose, Stockton
Zellerbach Paper Co. . . . . Fresno, Los Angeles, Oakland, Sacramento, San Diego, San Francisco, San Jose, Stockton
COLORADO
Carpenter Paper Co. . . . . Denver
Graham Paper Co. . . . . Denver
CONNECTICUT
Charles F. Hubbs & Co. . Bridgeport
The Rourke-Eno Paper Co. . Hartford
GEORGIA
Graham Paper Co. . . . . Atlanta
ILLINOIS
Abana Products . . . . . Chicago
Bradner Smith & Co. . . . . Chicago
Graham Paper Co. . . . . Chicago
Newhouse Paper Co. . . . . Moline
S. V. Cain, Inc. . . . . Peoria
IDAHO
Blake, Moffitt & Towne. . . . . Boise
INDIANA
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Carpenter Paper Co. Des Moines, Sioux City
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The Scioto Paper Co. . . . . Columbus
The Ohio & Michigan Paper Company . . . . . Toledo
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OREGON
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Hubbs & Howe Co. . . . . Erie
D. L. Ward Co. . . . . Philadelphia
The Chatfield & Woods Co. of Pa. . . . . Pittsburgh
TENNESSEE
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TEXAS
Graham Paper Co. . . Dallas, El Paso, Houston, San Antonio
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UTAH
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WASHINGTON
Blake, Moffitt & Towne . . . . Seattle, Spokane, Tacoma
Zellerbach Paper Co. . . . . Seattle
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The Honolulu Paper Company . . . . . Honolulu, T. H.

*KIMPAK (trademark) means Kimberly-Clark Creped Wadding

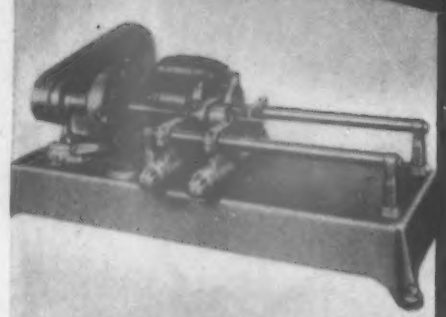
KIMBERLY-CLARK CORPORATION

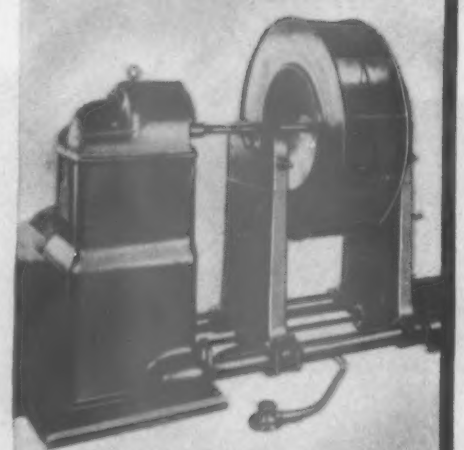
Neenah, Wisconsin

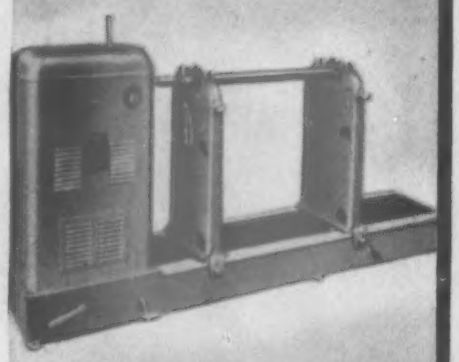
122 E. 42nd St., New York 17 • 8 S. Michigan Ave., Chicago 3
133 Sansome St., San Francisco 4 • 22 Marietta St., Atlanta 3, Ga.

how does BEAR DY-NAMIC BALANCING help YOU?

read these USERS' answers to your question







"We are Bear-Balancing 160 to 170 armatures a day. Service calls have been reduced to an absolute minimum."

"Bear Dy-Namic Balancing has greatly increased bearing life and eliminated vibration on our Centrifugal Fan Wheels."

"Vibration has been completely eliminated from our 21 inch blower wheels. We have had no difficulties with vibration or noise since we installed our Bear Dy-Namic Balancer."

Our Bear Dy-Namic Balancing Machine is doing an excellent job in balancing all types and sizes of Dynamotors, Converters and Generator armatures."

"Bear Balancing has increased the efficiency of our band saw wheels. There is a noticeable difference after balancing. We find they run much smoother and quieter after balancing."

Get complete information on Bear Dy-Namic and Static Balancers. Write for the FREE Industrial Bulletin TODAY!

2608

BEAR MFG. CO., Dept. F-1, Rock Island, Ill.

BEAR

COMBINATION

STATIC AND DY-NAMIC BALANCING MACHINES

Thor DISTRIBUTORS

THE NEW Thor

STANDARD DUTY

7" POLISHER

50% MORE POWER THAN ANY OTHER POLISHER IN ITS WEIGHT CLASS!

- *Rubber Bumper Guard*
- *1400 R.P.M. Free Speed*

Weighs only 9 Lbs.

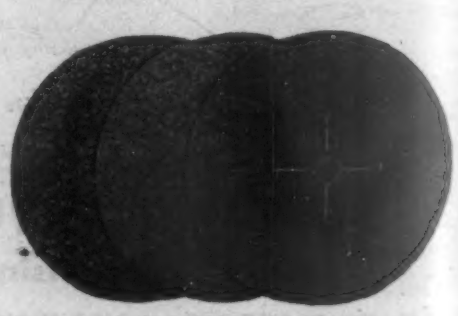
YES—50% more POWER than any other polisher in its weight class! Removes embedded dirt and grime quickly and easily, brings original color and body luster up factory-new! Streamlined design, perfect balance, effortless handling. Rubber bumper guard protects work and tool. Ball bearings throughout. Ask your Thor distributor for a demonstration today!

Only Thor accessories are built to last longer under the added power of the new Thor tools!

Rubber Backing Pads

Felt Backing Pads

Polishing Bonnets



Abrasive Discs In Popular Grades and Grits

ANNOUNCE...

THE NEW Thor STANDARD DUTY 7" SANDER

Ball Bearings Throughout
Rubber Bumper Guard
Spindle Lock for Easy Disc Change

No sanding job too tough for the might of this new and more powerful Thor electric sander. Saves five minutes in every ten removing paint, corrosion, oxidation, cleaning and smoothing metal and wood. New streamlined design, rubber bumper guard, spindle lock for quick disc change—all the features you've waited for in the industry's most advanced sander. Ask your Thor distributor for a demonstration today!

INDEPENDENT PNEUMATIC TOOL COMPANY
600 West Jackson Boulevard, Chicago 6, Illinois
Export Division: 330 W. 42nd Street, New York 18, N.Y.
Birmingham Boston Buffalo Cincinnati Cleveland Denver Detroit Houston Los Angeles Milwaukee New York
Philadelphia Pittsburgh St. Louis St. Paul Salt Lake City San Francisco Toronto, Canada Sao Paulo, Brazil London, England

Thor PORTABLE POWER TOOLS

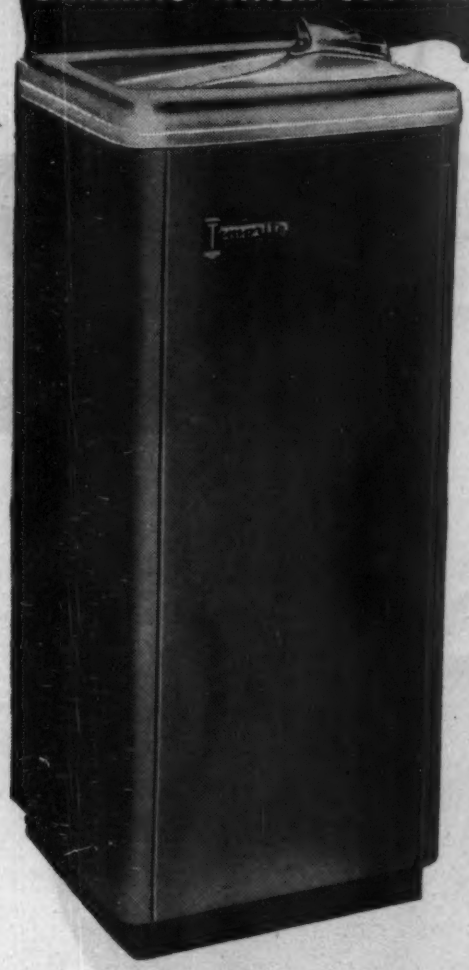
ONLY THOR DISTRIBUTORS SELL TOOLS FOR EVERY CUSTOMER'S EVERY JOB!

SMART

STREAMLINED STYLING in the New

TEMPRITE

DRINKING WATER COOLERS



1. Smart, streamlined styling blends harmoniously into all surroundings. 2. Effortless finger-tip pressure produces a steady stream of perfect-temperature drinking water. 3. No spouting, no splashing, no annoying fluctuations in water flow. 4. Bubbler design gives maximum sanitary protection.

User Protected by Temprite's 5-Year Warranty Plan

All models meet requirements of the National Bureau of Standards and Underwriters Laboratories, Inc.

Write for name of distributor in your neighborhood.

Manufacturers of water cooling equipment since 1929.

TEMPRITE PRODUCTS CORP.

35 PIQUETTE AVE. DETROIT 2, MICH.

YOU WANT TO KNOW

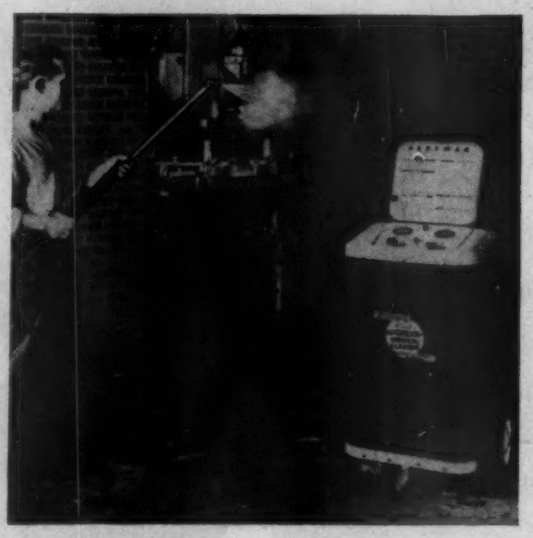
more about the items on this page

Letters to the addresses given will bring you further information.

CHART shows proper hand, band, or power-saw blade to cut metal of any type. Shows right and wrong way to use and how to overcome metal-cutting troubles. Two colors, 17x22 inches, free of charge. Victor Saw Works, Inc., Middletown, N. Y.

STENCIL CUTTER, electric, cuts oiled stencil board or cardboard. Character sizes—½, ¾, and 1 inch. Marsh Stencil Machine Co., Marsh Bldg., Belleville, Ill.

BOOKLET for distribution to employes. "Good Citizens" contains 72 pages, 9 keys to citizenship, 20 basic rights guaranteed by law. Price per copy, 25 cents; lots of 5000, 12 cents per copy. Prepared by sponsors of Freedom Train, The American Heritage Foundation, 17 East 45th St., New York 17.



CHEMICAL CLEANER for industrial equipment is electrically heated. Portable, no smokestack, anti-splash spray nozzle. Multiple safety devices. Heats in 1 minute. Hose length, 20 feet. Hartman Corp. of America, 5147 Natural Bridge Ave., St. Louis 15.

INSECT TOXICANT, Chlorodane, is non-crystalline. Leaves invisible residue, said to remain active for many months. Water resistant, non-repellent, kills by contact, ingestion, and release of vapor. Julius Hyman & Co., Denver.

HAND MAGNET, permanent type, lifts up to 15 pounds. Aluminum and stainless steel case. Releases load when fingertip lever is raised. Needs no current, wires, or batteries. Dept. 133, Multifinish Mfg. Co., 2114 Monroe Ave., Detroit 7.

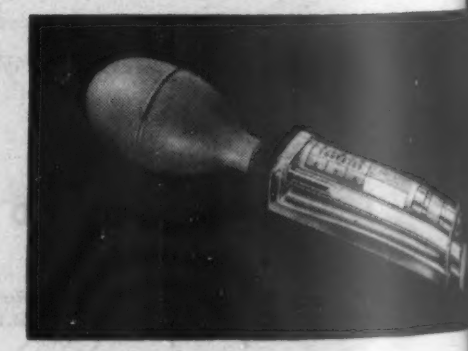
ELECTRONIC SEALER for cellulose acetate boxes eliminates cementing and improves box appearance. Said to eliminate distortion. Spectrum Engineers, Inc., Philadelphia.

ELECTRONIC DIFFRACTION instrument designed to aid observation and measurement of surface conditions of metals, ceramics, plastics. For investigation of problems associated with corrosion, catalysts, lubricants, metallurgy, pigments, surface deposits, graphite. General Electric Co., Schnectady 5, N. Y.

BEAM COMPASS and measuring rule is self-contained and compact. Draws 12-ft. circles. Reversible pivot, plastic case. Amerline, Inc., 1753 North Honore St., Chicago 22.

TOOL RACK consists of variety of hardwood blocks which slide into aluminum backstrip. Blocks are made for 31 different tools. Blocks can be arranged in any order. Davis Development Co., 348-50 First Nat'l. Bank Bldg., Colorado Springs, Colo.

STEAM HOSE made of fiberglass with inner and outer layers of rubber. Wall thickness is 9/32 inch. Said to withstand temperature of 388 degrees at 200 pounds working pressure. Goodyear Tire & Rubber Co., Akron.



CARBON MONOXIDE TESTER employs colorimetric method of detection. Rubber bulb aspirator. No training is required to operate it. Indicates presence of CO from 0.001 to 0.10 per cent by volume in air. Mine Safety Appliances Co., Pittsburgh 8.

SUGGESTION CABINET combines receptacle for suggestions with rack for blanks and display space for posters. Unit projects 3¼ inches from wall. Size

When travel time is vital...
"the vehicle makes the difference"

IN ALUMINUM PAINT, too...

"The VEHICLE makes the difference"

That is why Permite is the logical choice wherever utmost protection and durability are demanded in an aluminum paint.

The vehicle in PERMITE Aluminum Paint is an **exclusive,** scientifically balanced formulation of synthetic resins and specially processed oils. Skilful blending of this vehicle with 99+% pure aluminum pigment results in an aluminum paint that affords extra brilliance and light-reflectivity, extra protection, extra long life and economy.

The PERMITE exclusive vehicle promotes complete leafing action . . . cushions and floats the aluminum flakes into a many-layered, armor-like coat, firmly resistant to moisture and corrosion. PERMITE Paints save time and labor, too, because they're ready-mixed, ready to use. There is a type for every surface – interior and exterior.

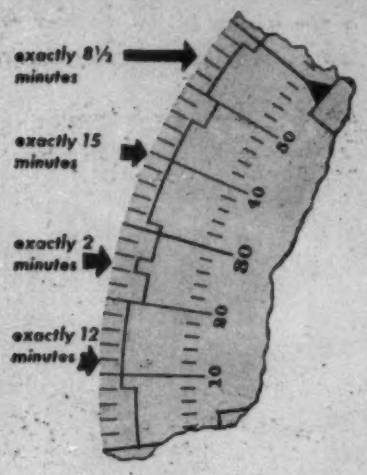
For paint jobs that look good, stand up, and cut maintenance costs, you can count on Permite extra quality. "The vehicle makes the difference." See your Permite Distributor or write for descriptive booklet.

ALUMINUM INDUSTRIES, Inc.
Cincinnati 25, Ohio

The Originator of
READY-MIXED Aluminum Paints

PERMITE *READY MIXED* **ALUMINUM PAINTS**

Process Timing



Bolt this 2 lb. Recorder right to the machine itself; let the "Process" record itself on the chart—(No ink, no pencil, no wires; the record is recorded in wax).

"The cure must be 8½ minutes"—"the heat must be applied exactly 15 minutes"—"the plating must take just 2 minutes"—"the pigment must be mixed just 12 minutes"—etc.

The *Servis Recorder* checks on this—it records just what happened—it *"times the process."* You are no longer in the dark; from now on you know all day and every day whether *your process timing* is lived up to—or if somebody slipped—if something went wrong to ruin your product for that afternoon, or that whole shift! Write for Process Timing Catalog.

THE SERVICE RECORDER CO.
1375 Euclid Avenue, Cleveland 15, Ohio.

The Servis Recorder
The "Time Clock" for Machinery

FASTER PRODUCTION WITH A BURRO

When you have a BURRO in the yard, you get jobs done faster, easier and more economically. This speedy, powerful locomotive crane does every job a crane can do with bucket, hook, magnet, tongs or drag-line and at the same time, serves as your private switch engine to spot cars *where* and *when* you want them. There is no waiting time with a BURRO.

BURROS are economical to operate, simple to maintain and are built for hard work. Watch a BURRO on the railroad or on a plant siding and see why it's the busiest crane on the track.

WRITE FOR ILLUSTRATED BULLETINS

CULLEN-FRIESTEDT CO.
1321 S. Kilbourn Ave., Chicago 23, U.S.A.

15¼x21½ inches. Personnel Materials Co., Suite 1439, 333 North Michigan Ave., Chicago 1.

GLASS TUBING CUTTER cuts tubing up to 7½-in. O. D. Includes hot wire cutting unit and adjustable supports. Foot switch is available. Meter on cutting unit enables operator to balance electrical output with variable length wire. Eberbach & Son Co., Ann Arbor, Mich.

ROOFING NAIL has neoprene washer attached. Available on iron, galvanized, aluminum nails. Producer claims roofing and siding will not pull these nails with expansion, contraction, wind load, or vibration. The Gora-Lee Corp., Stratford, Conn.

BOOKLET, "What's in the Taft-Hartley Law," for distribution to employes. Explains its principal points simply. Facts Illustrated, Inc., 1240 Huron Rd., Cleveland 15.

RADIATION METER measures radioactivity of low intensity. Portable Geiger-Muller counter weighs 9 pounds. Detects and measures X, beta, gamma radiations. Completely waterproofed. Battery operated; 3-ft. probe; aluminum case. Beckman Instruments, National Technical Laboratories, South Pasadena, Calif.

TIRE TREAD called Skid-Rid is used for retreading. Has rough abrasive substance milled into camelback. Practically eliminates need for chains for slippery driving, maker says. Goodyear Tire & Rubber Co., Akron.

FIELD WAREHOUSING described in booklet as means of borrowing on inventory to finance business. Lawrence Warehouse Co., 37 Drumm St., San Francisco 11.

COMMUNISM EXPOSED—A Digest of Communist Infiltration in the United

a new Ferret Set

by Snap-on

A new design... strong... adaptable... they squeeze into close places easily

(All units 3/8" Square Drive)
1/4" and 5/16" Single Broached Sockets
11—Double Broached Sockets from 3/8" to 7/8"
1—Speeder Wrench
1—8" Ratchet
1—Sliding Tee
1—Nut Spinner
1—Universal Joint
3", 6", and 12" Extensions
—Complete in a metal box, 19½" x 5¾" x 1⅜" — specially designed for this set. Rich red enamel finish.

Yes, a new Ferret set . . . new in design . . . way over par in performance — and they're twice as strong as you would expect such slim, slender handles and thin-walled sockets to be.

They squeeze into tight places and get those hard-to-reach nuts and bolts that defy the ordinary type wrench. Newly designed by Snap-on engineers, they make quick easy work of many of the tough jobs on modern motors and engines.

Be sure to ask your "Snap-on" man to show this set the next time he calls.

SNAP-ON TOOLS CORPORATION
8044-C 28th Avenue • Kenosha, Wisconsin
INTERNATIONAL DIVISION: KENOSHA, WISCONSIN, U. S. A.

The Symbol of QUALITY in Grinding Wheels . . .

NORTON ABRASIVES

THIS symbol means a wheel made in the world's largest grinding wheel manufacturing plant.

It means a wheel made by skilled workers — 10% of them Norton employees for 25 years or more.

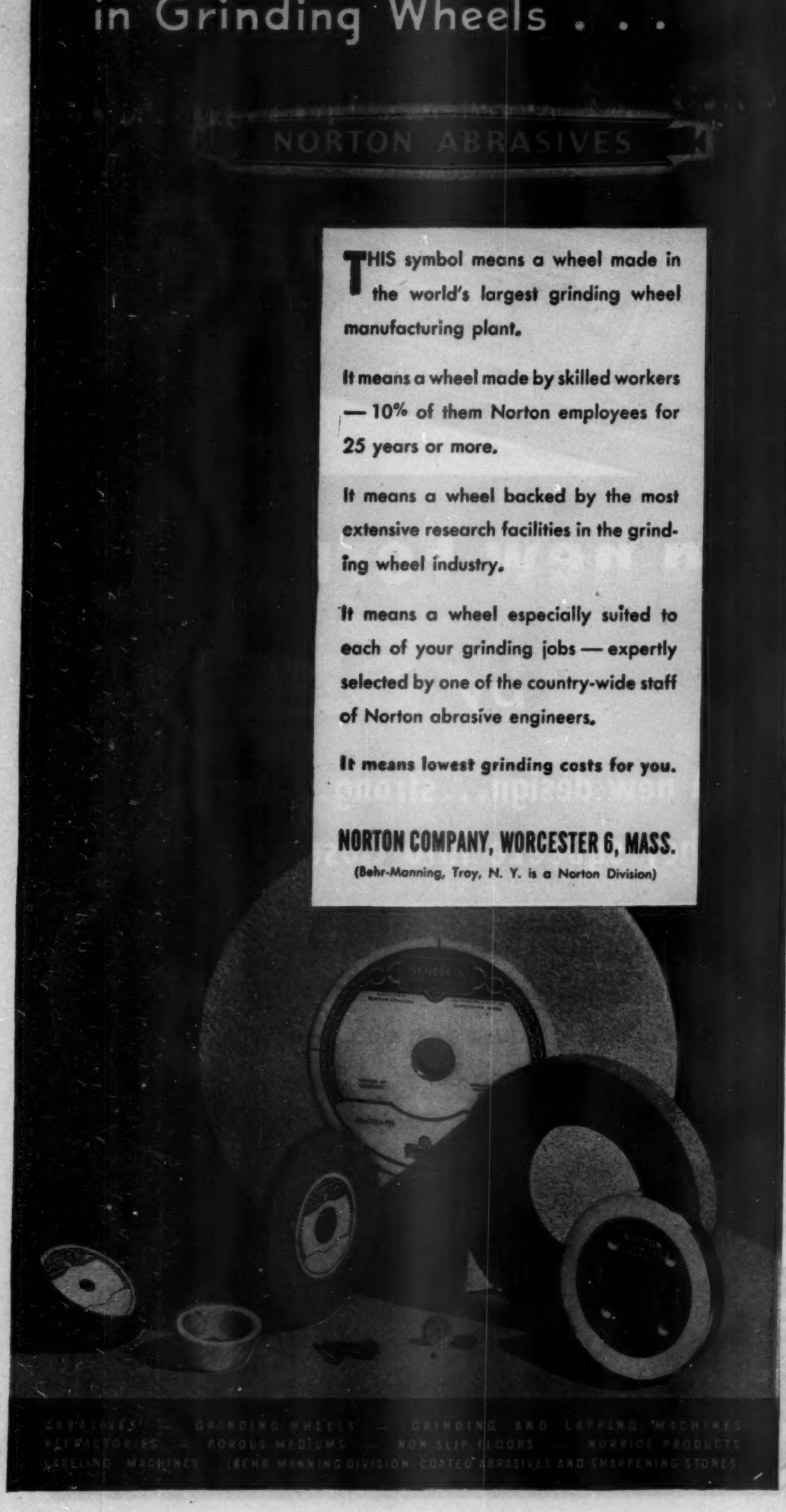
It means a wheel backed by the most extensive research facilities in the grinding wheel industry.

It means a wheel especially suited to each of your grinding jobs — expertly selected by one of the country-wide staff of Norton abrasive engineers.

It means lowest grinding costs for you.

NORTON COMPANY, WORCESTER 6, MASS.

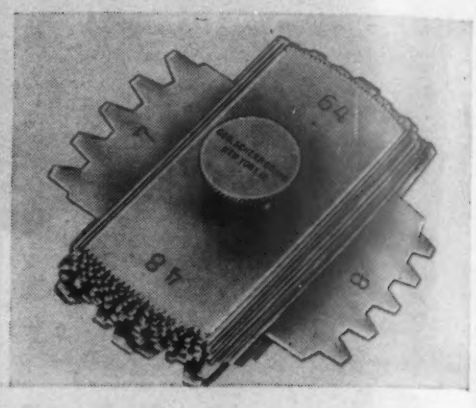
(Behr-Manning, Troy, N. Y. is a Norton Division)



States. Systematic analysis of communist tactics. Size, 3x5 inches, suitable for inclusion in pay envelopes. Bulk orders at printing cost. Chamber of Commerce of the United States, 1615 H St., N.W., Washington 6.

SPRING LOCK WASHERS of aluminum are lightweight, corrosion resistant. Said to have strength and spring tension equal to bronze or stainless washer. George K. Garrett Co., 1421 Chestnut St., Philadelphia.

CALLED HYCAR P.A., new type rubber is identified as a polyacrylic ester. Resembles pale crepe rubber. Vulcanized form is said to exhibit outstanding resistance to heat, oils, ultra-violet light, ozone, and gas diffusion. Used on standard processing equipment. B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15.



GEAR GAGE doubles as paper weight. Set of 12 leaves includes 24 gear shapes. Teeth are correct involute shape. Instrument is made of polished stainless steel. Geo. Scherr Co., 200 Lafayette St., New York 12.

COLOR MICROSCOPY technique involves dispersion staining. Claimed to provide speedier, accurate identification of colorless, transparent substances, including drugs and minerals. Requires standard microscope to operate. Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, N. Y.

WROUGHT STAINLESS STEEL can be hammered, rolled, and machined. Said to be impervious to sulphuric acid solutions at various temperatures and concentrations. Corrosion resistant. Chemistry of the steel unchanged in making it malleable. Carpenter Steel Co., 1937 Palmer St., Reading, Pa.

FILMS

Must It Rust? Sound film, 16mm., depicts zinc coating by hot dip process. Time—25 minutes. American Hot Dip Galvanizers Assoc., Inc., 1611 First National Bank Bldg., Pittsburgh 22.

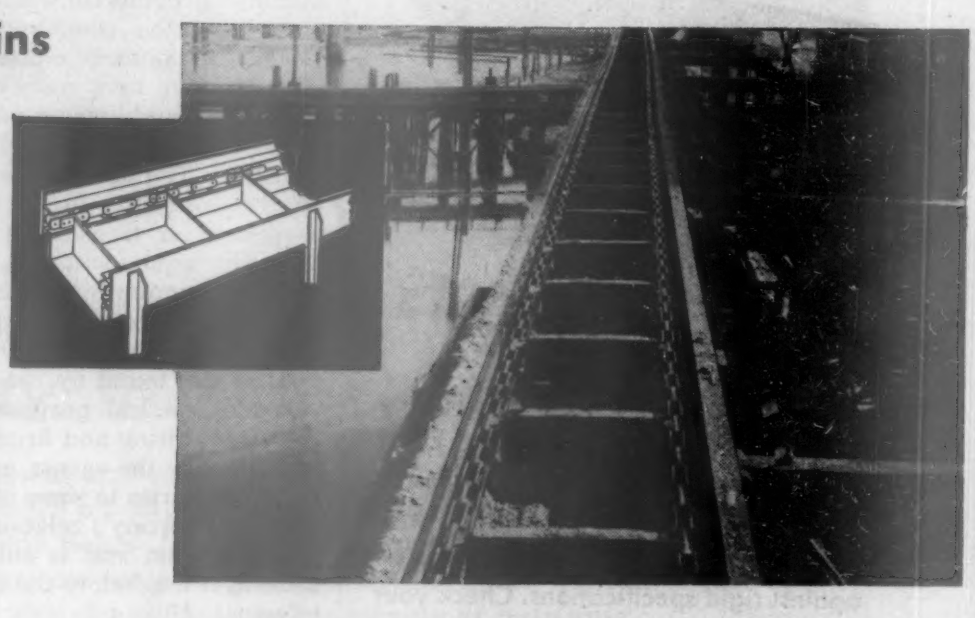
The Tragic Road to Safety, 144-frame, 27-min., sound slide film points up basic causes of highway accidents and ways to avoid them. Suggested remarks for speaker are included. $25 for film and record set. Commercial Films, Inc., P. O. Box 7, Cleveland 21.

Moves" . . . for More Efficient Materials Movement

• A good move before installing any materials handling system is to investigate Rex Conveyor Chains and Sprockets *first!* That's because Rex Chains and Sprockets are more economical! They are designed specifically for the job to be done . . . constructed of durable, wear-resisting materials . . . have stamina built into every link and wheel. That's why Rex Conveyor Chains stay on the job . . . are easier to maintain. Here are just a few of the many efficient Rex Chain applications which help industry move more for less.

Scraper Flight Conveyor Chains

• Rex Chains and Sprockets can be furnished with attachment for scraper flights. These chains are particularly suited to withstand the severe service of moving wood chips, small lumber, coal, hog fuel, sugar bagasse, etc. The chains keep things moving by pushing material along the troughs. Discharge is easily accomplished through gates . . . at any point. Flights can be of wood or metal mounted on single or double strands of chain. Chain is flexible and can be readily adapted for any type of service for positive material movement. *A proper move for dependable materials movement!*



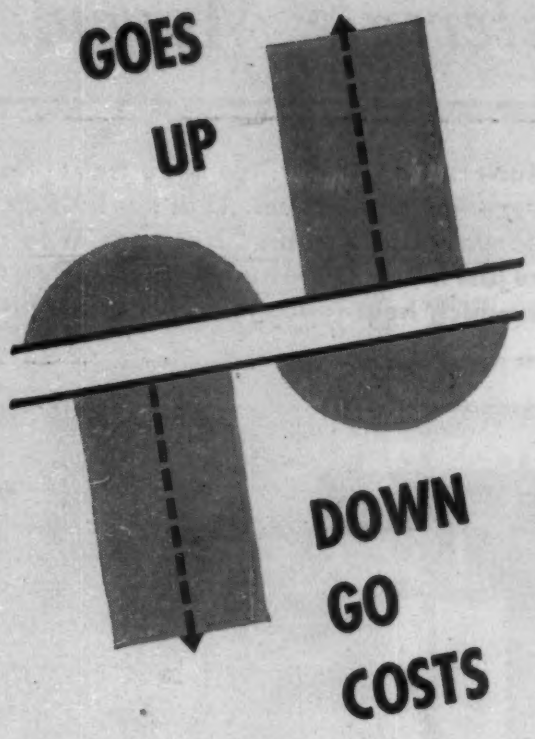
Rex Drag Chains

• Rex Drag Chains and Sprockets offer one of the simplest, yet most effective methods for moving some types of raw and refuse material. This means of movement consists of chains running in simple troughs. Malleable iron chains are used for sawdust and similar materials. For more severe usage, such as ashes, Z-metal chains give lasting service. Durable, cast steel chain moves heavy abrasive or hot materials such as cement clinker, coal, etc., with equal efficiency. *A natural move toward efficient materials handling!*

• Chain Belt Company has a complete line of standard chain and sprocket for every industrial materials handling service. So whether you have a major conveying problem or just a simple chain application . . . you'll save time and money, keep things moving . . . if you see your Rex Representative *first.* For all the facts contact the Chain Belt Company, 1667 West Bruce Street, Milwaukee 4, Wisconsin.

DRIVE AND CONVEYOR CHAINS

PRODUCTION



—when you depend on the superiority of PENN RIVET'S fastenings. Every PENN fastening is a quality piece made with exacting attention to material and finish, and carefully checked against rigid specifications. Check your production costs now! Then lower them by calling on PENN for . . .

Tubular, Split and Compression Rivets
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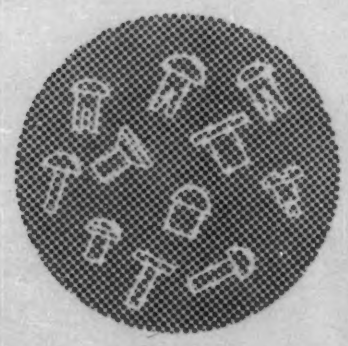

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BENJAMIN WERNE, Lecturer in Government Regulations, New York University, and a Member of the New York Bar

Period Surveyed December 1 to January 1

TREND INDICATORS
Wage-Hour

HELD EMPLOYEES

Persons working at agency offices of the telegraph company are employees rather than independent contractors. The main reason for the company having converted its company offices into agency offices was to save money by reducing expenses, mainly wages paid, and to increase revenue by extending the hours of service. The agents, who were chosen by the company, hired the personnel necessary for transacting the business. Company equipment was used in each place in conformity with prescribed standards of service. Supervision and control were exercised by the company, and, as was found by the district court, "for all practical purposes, other than the direct hiring and firing of personnel employed by the agents, and direct payment of salaries to some of such personnel, the company's relation to the agencies has been and is substantially the same as it was before the conversion was effectuated."

Agency offices were under the immediate supervision of the district superintendent of the company, who was instructed to supervise and deal with agency offices as if they were company offices. **(Western Union Telegraph Company v. McComb; CCA-6)**

COMPROMISE CLAIM VALID

There is nothing in the Portal-to-Portal Pay Act which prohibits the compromise of claims where a *bona fide* dispute exists as to the number of overtime hours and the rate of pay, provided there is no fraud or duress, and that any such compromise entered into by an employee shall be a complete satisfaction of the claim and a complete bar to any cause of action based thereon. Where the plaintiff had previously admitted the existence of a dispute, the settlement thereof by compromise, and the full performance by the employer of the agreement of compromise, the plaintiff may not now claim that no dispute existed at the time the agreement was entered into, since the claim which is the subject of the action was validly compromised and settled. (Weiss v. Testrite Instrument Company; N. Y. Sup. Ct., Appellate Dept. First Div.)

DIFFERENTIAL BETWEEN SEXES ALLOWED WHERE WORK IS DIFFERENT

Under the New York statute which provides that "no employee shall, because of sex, be subjected to any discrimination in the rate of her or his pay," an employer is allowed to pay a female employee a lower rate of pay than that paid to male employees, where the difference in the work of the employees justifies a differential in the wages paid. In his decision, the industrial commissioner stated, "Equal pay for men and women in the same general employment is not provided for by the statute. Reasonable classification and grading of employees, which is not discriminatory against women because of sex, is not prescribed, and an employee may not assert a grievance because of it." (Corsi v. Bentley Stores Corp.; NYC Municipal Court, Borough of Manhattan)

FIREMEN AND WATCHMEN NOT ENTITLED TO PREMIUM PAY FOR SATURDAY AND SUNDAY

A contract clause which provides for premium pay for Saturdays and Sundays does not apply to firemen and watchmen who regularly work on weekends. A review of other agreements showed a fairly standard pattern for exempting powerhouse employees and watchmen or others whose scheduled work week includes Saturday or Sunday from premium pay provided for working Saturdays or Sundays as such. The reason for paying premiums on weekend work is to protect the workers' days of rest by deterring the employer from calling them in on such days. There is more emphasis on discouraging such work than on benefiting the employee for working. If double time on Sundays or time and one-half for Saturday work as such were granted to firemen and watchmen, it would give them better conditions than other workers who rarely are assigned such work. (In re arbitration between E. Cummings Leather Company, Inc., and International Fur & Leather Workers Union of the United States and Canada)

EMPLOYER PROHIBITED FROM CORRECTING LONG-ESTABLISHED ERROR IN STANDARD

An employer is prohibited by the contract from correcting long-established errors. Thus, an employer who used an erroneously high standard on a certain job for almost two years may not, at the time of a minor change in the job, revise the past standard. Although standards which are out of line are wrong, because they do not honor the principle of equal pay for equal work, the arbitrator pointed out that the agreement provides, "The company may partially revise permanent incentive standards for any job in which there has been a change in the job which revises the work content of

How A Single Source of Supply Aids Economy in Floor Care

It's convenient to buy floor-maintenance equipment and related products from one source, but a single source of supply such as *Finnell* offers many more advantages. Serving all industries, *Finnell* makes equipment for every type of floor care . . . for all floors . . . all areas. From the *Finnell* line you can choose the equipment that provides the maximum coverage for your particular floors—whether maintenance calls for wet scrubbing, dry scrubbing, or dry cleaning . . . or for waxing or polishing.

***Finnell* also makes a full line of Cleansers specially developed for the greater speed of mechanical-scrubbing. The cleaning action of *Finnell* Cleansers *keeps pace* with the speed of the machine. This cuts operating time, which in turn reduces labor costs and saves on brushes.**

In waxing, too, co-ordinated economy can be effected, by doing the job mechanically with a portable *Finnell* and *Finnell-Kote*, the solid wax that's applied hot. This process produces a finish unique in wearing and protective qualities, and hence is more economical on a year-to-year cost basis.

In addition to a full line of *Machines, Cleansers,* and *Waxes, Finnell* makes several types of *Sealers* . . . also *Mop Trucks, Steel-Wool Pads,* and other accessories. The nearby *Finnell Floor Specialist and Engineer* is readily available for free floor survey, demonstration, or consultation . . . and for training your maintenance operators in the proper use of *Finnell* equipment. Phone or write nearest *Finnell* branch or Finnell System, Inc., 2502 East Street, Elkhart, Indiana. Canadian Office: Ottawa, Ontario.

* * * *

The *Finnell* illustrated at left is a *Self-Propelled Combination Scrubber-Vacuum* for use on large-area floors. A complete cleaning unit *all in one*, it applies the cleanser, scrubs, rinses if required, and picks up. Has a cleaning capacity up to 8,750 sq. ft. per hour!

FINNELL SYSTEM, INC.

Pioneers and Specialists in

FLOOR-MAINTENANCE EQUIPMENT AND SUPPLIES

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Slowly revolving outlets distribute the heated air continuously downward in a constantly changing direction, completely and thoroughly covering the working area

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such job. The revision, however, must be made only to the extent of the change in work content and any portions of the original job which remain unchanged may not be revised. . " It was the arbitrator's understanding that the clause means the frozen standard cannot be altered except in those elements which have been altered. "If arbitration is to mean anything, the arbitrator must be governed by the terms of the agreement." (In re arbitration between The Hoover Company and United Electrical, Radio & Machine Workers of America-CIO)

LABOR-MANAGEMENT RELATIONS

*EMPLOYER'S RIGHT TO SUBCONTRACT WORK

Where the contract was silent on the matter of subcontracting work, the employer was within his rights when he discontinued the operation of one department and contracted out the former work of that department. The company has the sole right to control, manage, direct, and operate its business as it deems proper, and is only limited in its action either as it is circumscribed by law or restricted by conditions provided in the collective bargaining agreement. In this case, the company found that the costs of operating the department were too high. A trial period which allowed the union an opportunity to cooperate with the company in bringing about a more economical operation failed to accomplish the endeavor. Thereafter, the company decided to discontinue having the work done at the plant and it found that it could have the work contracted out at a much lower cost.

Since the company had in no wise surrendered any prerogative with regard to subcontracting, it was not restricted from discontinuing a department and having the work done by subcontractors. (In re arbitration between Amoskeag Mills, Inc., and Textile Workers Union of America-CIO)

*EMPLOYER'S RIGHT TO ABOLISH AN INSURANCE PLAN

An employer has the right to abolish an insurance plan which he instituted unilaterally, and replace it by a new plan. Both the employees and the employer agreed that the old and the new insurance plans were wholly voluntary. The arbitrator held that there was no contractual or other obligation on the part of the employer to retain one plan in preference to another, nor were the employees obligated to obtain coverage. (In re arbitration between Jas. H. Matthews & Company, Inc., and International Metal Engravers Union)

*EMPLOYEE MAY NOT BE DISCHARGED FOR ERRORS WERE DUE TO LACK OF TRAINING

Where the company failed to give proper training to an employee, it can not later discharge him for repeated errors caused

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* In this classification, items marked with an asterisk also are considered to be trend indicators.

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Here's the score, 10 or more reasons for using everlasting fastenings . . . *just 1 for common steel.* An amazing combination of advantages in favor of non-ferrous and stainless bolt and nut products . . . only lower first cost in favor of common steel. Check the list against your own fastening requirements. Write us for details.

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RESISTANCE TO CORROSION
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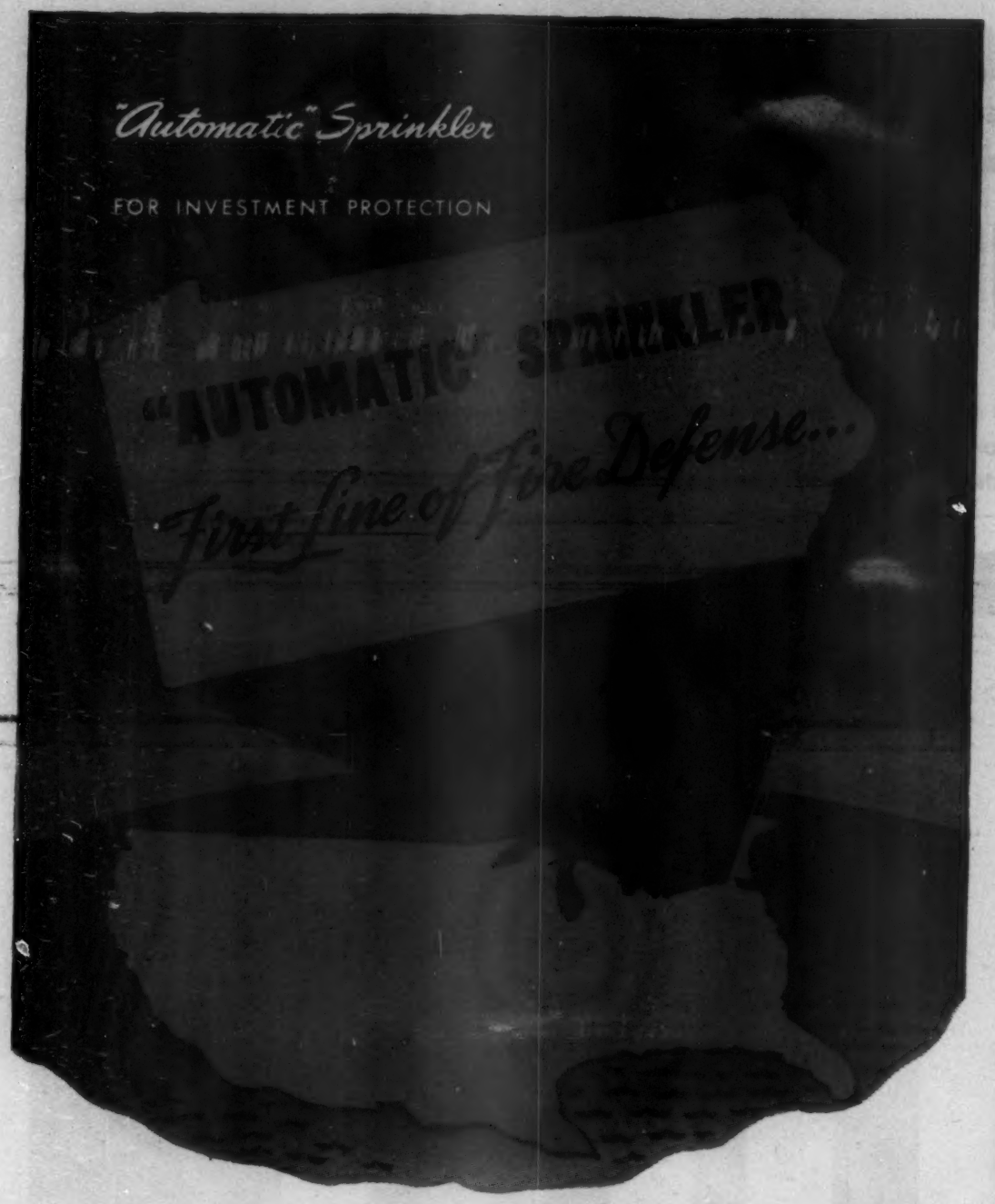

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For thousands of years, the greatest amount of energy has been exerted to master fire, but fire is not a trivial matter and, although you may lessen its probability, you cannot remove its possibility. The lessons to be taught from fire are not to be found in the ashes of dissipated hopes. Tens of thousands of buildings, protected by means of "Automatic" Sprinklers, stand as "perpetual monuments" of foresight.

Claims may easily be made, but the accomplishments of "Automatic" Sprinkler during more than sixty years of fire protection development, must have ability behind them. Their position has been gained by fighting fire. They have won because they have outwitted fire.

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The arbitrator mentioned that the job is one which requires considerable skil and can be learned only by doing. "Either the learner is given adequate training before he is put on his own or he learns by trial and error. . . . Although the plant superintendent undoubtedly did give considerable verbal instructions, they alone do not assure competence." (In re arbitration between A. Gross Candle Company, Inc., and United Gas, Coke & Chemical Workers of America-CIO)

***EMPLOYER IS REQUIRED TO BARGAIN WITH UNION WHICH STRUCK ILLEGALLY**

An employer was guilty of a refusal to bargain where he failed to bargain with a union which violated the no-strike clause of the contract, relying on the fact that the union breached the contract and thus abrogated the breached agreement. Even if the contract was breached, the union would still have the right to bragain for the company's employees if it represented them. At the time the company refused to bargain with the union, the union did represent a majority of the employees the company then had. "A reduction in the size of the unit, where the character of the work remains the same, does not affect the status of the bargaining agency, for if this were so any day-to-day change in employment could be used as a reason to compel a new demonstration of majority status and lead only to utter chaos in labor relations."

A no-strike clause is no guarantee that interruptions in the company's operations will not occur. The board pointed out that "unless the statutory duty to bargain collectively is held to remain in force even after a labor contract previously made, has been broken, the purpose of the act to promote industrial peace through collective bargaining will be attained only in small measure." (Lancaster Foundry Corporation and International Moulders & Foundry Workers Union of North America-AFL, NLRB)

***FOREMAN MAY NOT BE BARRED FROM PRODUCTION WORK**

A foreman may not be barred from production work where such duties have been part of his job operation over a period of years and there has been no stated limitation on them by agreement between the parties. The foreman never performed physical work in excess of an average of two hours a day, and no employee had even been actually displaced

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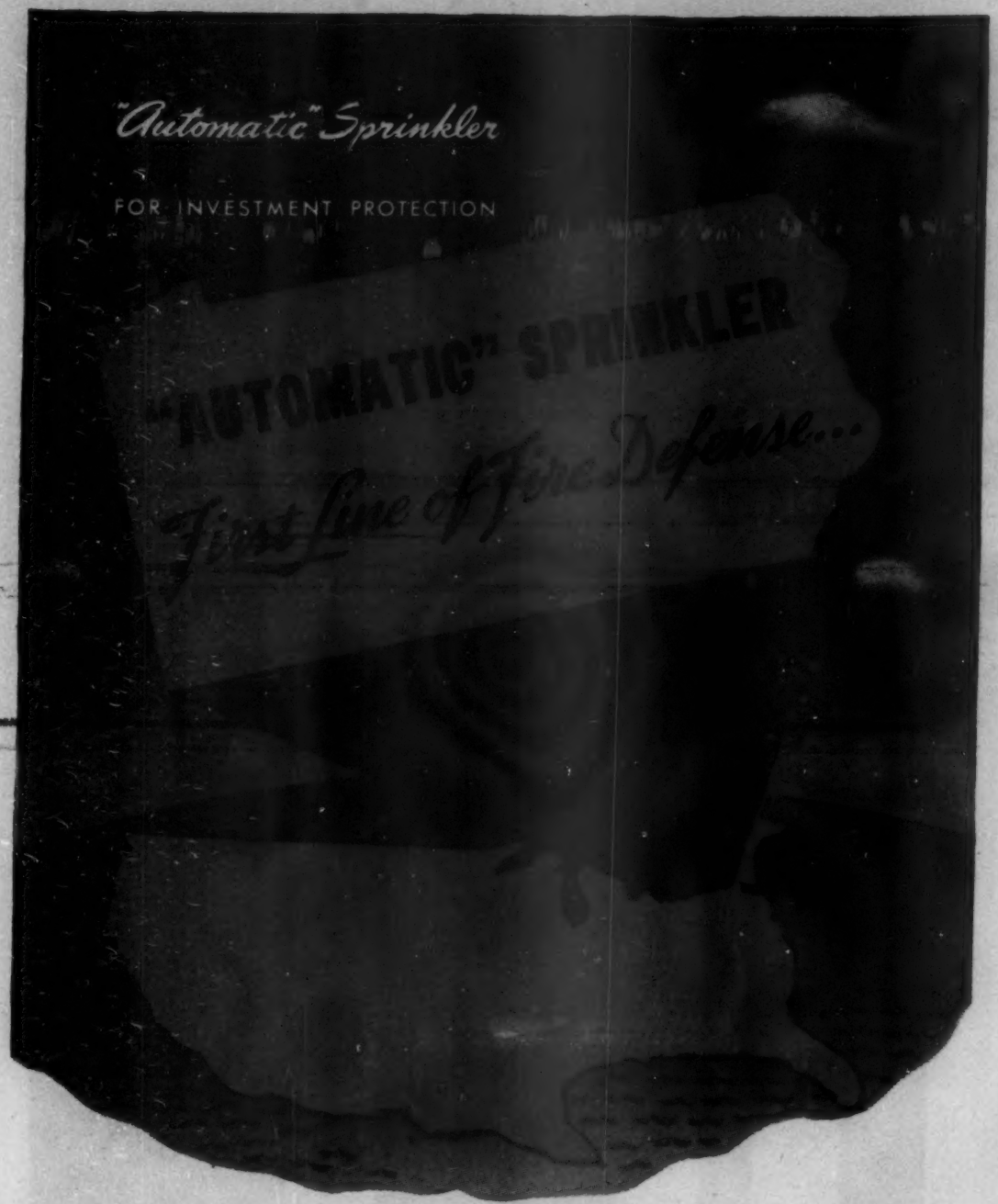

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TYPE "YS" Automatically

Takes up ◆ *Pays out*

CONDUCTOR CABLE on Busy TRAVELING HOISTS

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- Rating: 15 Amperes—550 Volts, A. C.; 250 Volts, D. C.

Speed! Safety! Uninterrupted Power! Longer Cable Life! Appleton Reelites bring all four to the production line, wherever traveling electric hoists are used.

Action is smooth, constant, automatic. Springs of finest clockspring steel keep cable under just the right tension. Cord can't kink, drag, or catch on obstacles. Eliminated are breakdowns in power, hazards for personnel and equipment.

Collector rings within the reel are accurately machined to run true. Brushes are in floating tension. All are fully enclosed.

With 45 feet of cord, the Type "YS" Reelite, when mounted midway, supplies continuous power to a hoist traveling 90 feet. Turning on a nearly frictionless swivel base, it pays out the cord in either direction to follow curves in the track.

Rugged construction. Oil-less bearings. Rings and brushes readily accessible, should service ever become necessary. Equipped with Neoprene jacketed cable for longest service. No production operation with traveling electric hoists is modern without Reelite!

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There is a Reelite of correct design and size for every operation where electrical equipment moves. Write for Bulletin No. 504 which supplies complete information on all Reelites. Or see Sweet's File, 1948, page 2a/15.

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by reason of the work performed by the foreman.

The fact was brought out that the foreman of the production control department has the responsibility for maintaining complete checks on the flow and requirements of material between and among departments and must insure its rapid movement. The foreman of the department has performed some physical work without any objection, and for some time even worked exclusively within the department without any assistance. The arbitrator, considering the entire background to the present dispute, could not sustain the union's contention. (In re arbitration between Dictograph Products, Inc., and United Electrical, Radio & Machine Workers of America-CIO)

***ACCEPTANCE OF SEVERANCE PAY IS NO WAIVER TO CLAIM FOR REINSTATEMENT**

Despite the fact that an employee accepts severance pay upon his dismissal, he may later claim that his discharge was in violation of the contract. The company contended that the claims of the Guild were waived by the acceptance of severance pay by the employees, and cited a number of cases supporting the principle that "a party who accepts any benefits under a judgment cannot appeal from that judgment at least in so far as the portion of the judgment appealed from and the portion of the judgment under which the party accepted benefits are interdependent."

The arbitrator held, however, that the cases cited were not applicable in the present case. The acceptance of severance pay by the employees cannot be considered a waiver, but those employees reinstated are to repay the severance pay to the company. (In re arbitration between The Newspaper PM, Inc., and American Newspaper Guild-CIO)

***CONSTITUTED UNFAIR LABOR PRACTICES**

An employer was guilty of interference when he questioned his employees concerning their union membership. Such interrogation is coercive and therefore *per se* an unfair labor practice. The board held that the employer's conduct in questioning the employee was not an expression of "any views, argument, or opinion, or the dissemination thereof," within the meaning of Section 8(c) and thus is not protected thereby.

The employer also violated the Act when he failed to question the union's majority at the time of his refusal to bargain. If the employer had questioned the union's status, the union and the employer might have agreed upon a method of establishing the union's status to their mutual satisfaction. (Ames Spot Welder Company, Inc., and United Electrical, Radio & Machine Workers of America-CIO; NLRB)

***EMPLOYEES ENTITLED TO REPORT TIME AT PREMIUM RATE**

Under a contract clause which provides that employees "called to work or permitted to come to work . . . shall receive a minimum of 4 hours' pay at the regu-

Crescent PALLETIER stacks filler material used in compounding record stock, in the plant of Capitol Records, Inc., Scranton, Pa.

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You'll step up the tempo of load and unload operations with a Crescent PALLETIER—up ramps and down narrow aisles, quickly, quietly, smoothly.

Maneuverable, power-packed PALLETIER is low in initial cost and maintenance. It soon pays for itself by slashing your handling costs.

Crescent PALLETIERS cover a range of capacities—from 1,000 to 6,000 lbs. The Crescent line also includes various types of high and low lift trucks and industrial tractor units. Make use of our engineering service or write for free descriptive bulletins.

5 IMPORTANT FEATURES
Only the PALLETIER Has Them All

1 **Full Magnetic Contactor Control** protects against forced acceleration—extends life of motor and tires.

2 **Complete Stability** with load fully elevated and tilted forward.

3 **Battery Power** eliminates fumes and fire hazard.

4 **Full Accessibility** to all mechanisms for easy inspection and maintenance.

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Searching for *sound* economies, many plant engineers have found they can effect these 3 important water line savings by using Transite Pipe:

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2. Operation. Transite Pipe has an initial high flow rate of C-140 that can never be reduced by tuberculation, the costly internal corrosion which chokes off carrying capacity. Transite's *maintained* high carrying capacity helps keep pumping costs low!

3. Maintenance. Transite Pipe is strong and durable. Made of asbestos and cement combined under great pressure into a tough, dense, homogeneous structure, this pipe resists corrosion *inside, outside,* and *all the way through.* Year after year, Transite Pipe provides efficient and economical service for water supply lines, fire lines and process lines of many types.

Get all the facts on the many advantages of Transite Pipe by writing to Johns-Manville, Box 290, New York 16, N. Y. Ask for the Transite Pressure Pipe brochure.

JM PRODUCTS

Johns-Manville
TRANSITE PRESSURE PIPE
for Water Supply Lines • for Fire Lines • for Process Lines

lar hourly rate . . ." employees called in on a premium day are entitled to a minimum of 4 hours' pay at the appropriate premium rate. The clause, as it reads, means 4 hours at the employee's rate for the day in question.

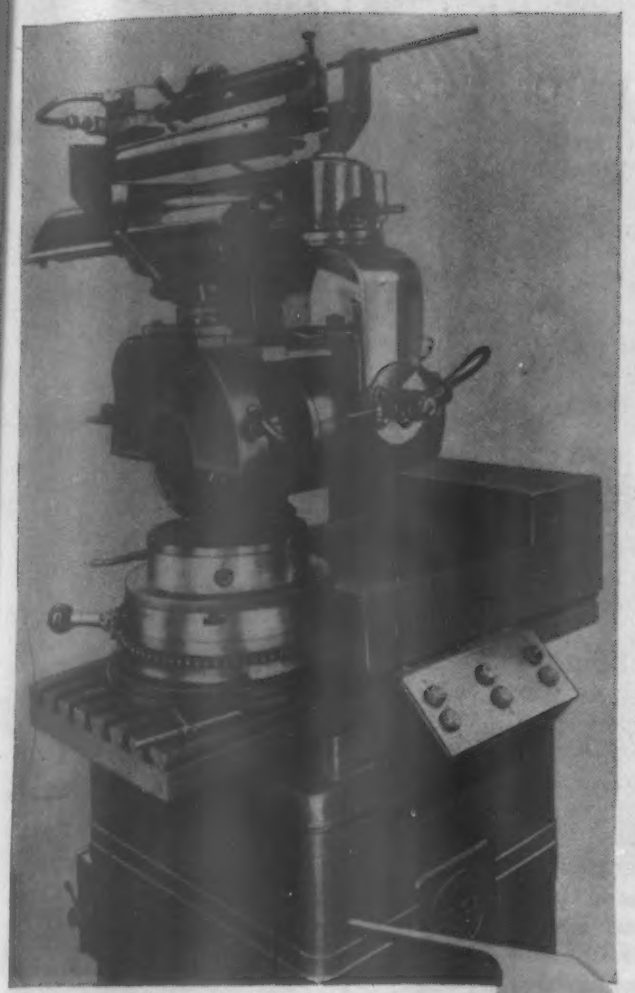
The arbitrator pointed out that the term "regular hourly rate" was used in this clause to distinguish it from a set rate or the rate of the work to which the employee may be assigned for part of the time and applies equally to all days and to all employees regardless of when they were sent home during the 4 hours. It seems improbable that the phrase was meant to introduce a novel differentiation applicable only on some days and dependent then on when the employee was sent home during the 4 hours; or that it was meant to deny for this purpose the generally accepted consideration given to the interruption of an employee's enjoyment of his Sunday or holiday. (In re arbitration between Ford Motor Company and United Automobile, Aircraft and Agricultural Implement Workers of America-CIO)

***EMPLOYEES SCHEDULED TO WORK ON SATURDAY FOR HOLIDAY**

Where the contract provided that employees shall be paid for unworked holidays provided they fall within the employer's regular scheduled work week, an employer was required to pay employees who were scheduled to work on Saturday despite the fact that he did not schedule work on Saturday because of the holiday. The company claimed that Saturday cannot be considered one of the regularly scheduled work days, because usually only a portion of the working force is asked to work on Saturdays. The union argued that the company is not on a 5-day week, and therefore Saturday is a regular work day. The evidence submitted by the company showed that on the Saturdays immediately preceding and following the holiday, employees were called in to work and if it were not for the holiday they would have called in a group on February 22 also. (In re arbitration between Standard Brands, Inc., and Amalgamated Meat Cutters & Butchers Workmen of North America, Meat & Cannery Workers Union)

***EMPLOYEES' RIGHT TO PICKET WHERE NO LABOR DISPUTE EXISTS**

Employees have the right to picket whether or not a labor dispute exists, when they have a direct economic interest to protect. In the instant case, Negroes peacefully picketed a retail establishment that caters to Negro trade, for the purpose of inducing the operators of that establishment to hire Negro workers in proportion to Negro patronage. Picketing is justified even if the relationship of employer-employee does not exist and where no dispute at all exists between the employer and employee. The picketing by the Negroes would not result in a breach of contract between the union and the store. The pickets only demanded that



At the production rate of three pieces per minute, the S. K. Wellman Company of Cleveland, Ohio, is performing grooving operations on powdered metal aircraft parts approximately four times faster than ever before. This has been achieved by incorporating several automatic devices with a standard Walker-Turner Radial Cut-Off Machine to convert it into an automatic-radial grooving machine.

For this grooving operation the Radial Cut-Off Machine is equipped with a diamond impregnated metal wheel to do the cutting, and a magnetic chuck for work holding. The sliding head is motivated by an air cylinder with provisions for metering the feed. With this set-up extremely accurate work is done—the depth of each groove held within .003", and the accuracy of the index within .005".

In addition to increased production, Walker-Turner Machine Tools have given the S. K. Wellman Company continued operation with trouble-free maintenance. Says Mr. S. E. Truesdell of the company's engineering department: "Three Walker-Turner machines have been in our possession about five years, and in that period a very minimum, if any, maintenance has been required. We find these machines ... *are highly adaptable to intricate machining jobs with minimum set-up time.*"

For complete catalog, write to Walker-Turner Company, Inc., Plainfield, New Jersey.

Photo left: Radial Cut-Off Machine in S. K. Wellman set-up for radial grooving with magnetic chuck and diamond wheel. Indexes automatically at the end of each ram traverse cycle.

Photo, below: Radial Cut-off Machine, Model MRA-1130, 3 h.p., 3450 r.p.m. motor. Price: Less abrasive wheel, magnetic overload release and base $485.00.

FOR EXAMPLE

GROOVING OPERATIONS *4 TIMES FASTER*

by S. K. WELLMAN COMPANY

with WALKER-TURNER radial cut-off machine

walker-Turner MACHINE TOOLS

DRILL PRESSES—HAND AND POWER FEED
RADIAL DRILLS • RADIAL SAWS
BAND SAWS—FOR WOOD OR METAL
RADIAL METAL CUT-OFF MACHINES • MOTORS

SOLD ONLY BY AUTHORIZED INDUSTRIAL MACHINERY DISTRIBUTORS

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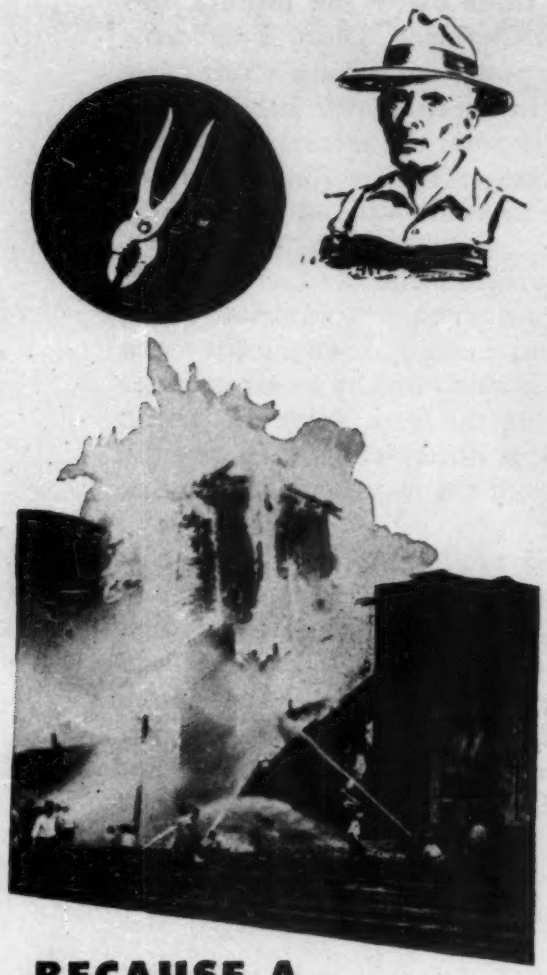


BECAUSE A FARMER LOST HIS *Pliers...*

• This story is short, tragic and typical. The farmer's lost pliers landed in a grain truck headed for the elevator. Dumped with grain into the mill elevator intake, the pliers struck a brace hard enough to spark and set off a dust explosion.

From the spark on, the story concerns only firemen and ambulances . . . Later, insurance adjustors — and planning the new mill. This time with magnetic separation protection.

Dings Magnetic Separators could have prevented this disaster by catching the tramp iron before it caused trouble. Separators not only prevent fires, they protect grinders, pulverizers and other machinery from damage by iron.

A nearby Dings Representative will be glad to discuss protection for your plant. Write for literature on the specific Dings equipment that will do the best job for you.

DINGS MAGNETIC SEPARATOR CO.
4712 W. McGeogh Avenue, Milwaukee 14, Wis.

Dings "HIGH INTENSITY"

"Magnetic Separation Headquarters Since 1899"

LABOR DEVELOPMENTS *(continued)*

as white help quit or are transferred, they be replaced with Negroes. The evidence showed that the union was willing to accept Negro clerks. (Hughes v. Superior Court; Calif. District Court of Appeals, First District)

***EMPLOYEE ENTITLED TO HEARING BEFORE EXPULSION FROM UNION**

An employee who was expelled from a union was entitled to a hearing before the main body of the union, in accordance with its constitution and bylaws. The employee should be reinstated, even if his conduct justified expulsion, since his contractual rights were violated. The constitution and bylaws are in effect a contract between the union and its members. (Curatilla v. Heide, Inc., NYSC, N. Y. County)

***UNION SHOP PROVISION OF CONTRACT SIGNED PRIOR TO THE ACT IS VALID**

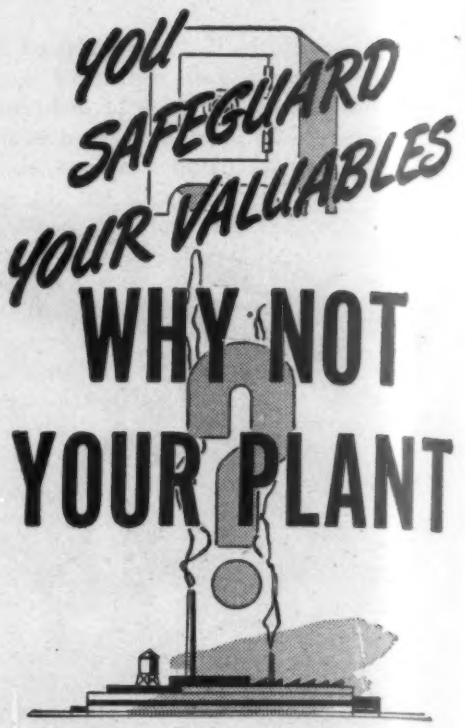
There is nothing in the Labor Management Relations Act of 1947 which in any wise impairs the legality or validity of a contract, signed prior to the Act, which provided that all employees shall be union members and that any work contracted out shall go only to shops employing union members. The impartial chairman held that all such provisions are valid, legal, and binding.

Therefore, a clothing manufacturer who entered into an arrangement with a clothing contractor doing business in the state of Georgia, none of whose employees were members of the union, for the manufacture by said contractor of 1200 pairs of pants, violated the contract. The union was entitled to recover a sum of money from the employer, which sum represented the earnings of which its members were denied by reason of the employer's action. (In re arbitration between Irving Horowitz and Amalgamated Clothing Workers of America, New York Joint Board-CIO)

***UNION'S RIGHT TO LEVY ASSESSMENT TO FIGHT STATE MEASURE**

A union had the right to levy an assessment of $1 against each member for a fund to be used in a campaign of public education to defeat a state measure designed to prohibit the union shop. The constitution of the union, which sets forth its object and purposes, covers authorized and lawful opposition to contemplated legislation which, in the opinion of the members of the federation, would be inimical to their welfare individually or collectively.

The plaintiff asserted that the compulsory assessment on each member was a violation of each and of all of his stated individual rights. He went on to say that his payment of the assessment would be an expression on his part contrary to his personal beliefs. The union's action, however, in raising the fund was in accordance with the majority of the members of the local. "Mere disagreement with the majority rule does not absolve the dissenting minority from compliance with action of the association taken through authorized union methods. And



It can be quickly and effectively accomplished by surrounding your property with a Stewart Non-Climbable Chain Link Wire Fence. And you are assured of greater protection over a longer period of time because the Stewart exclusive Oval-Back, All-Beam fence framework is the heaviest and strongest manufactured. Before you buy, be sure to see what Stewart has to offer. Catalog No. 83, containing complete information, will be sent on request.

Stewart 3TH Chain Link Wire Fence. Also available in 5TH (5 strands of barbed wire).

STEWART WIRE MESH PARTITIONS

Sectional with standard panels. May be arranged to fit any space. Ideal for locker rooms, toolrooms, storage rooms.

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Stewart maintains sales and erection service in all principal cities.

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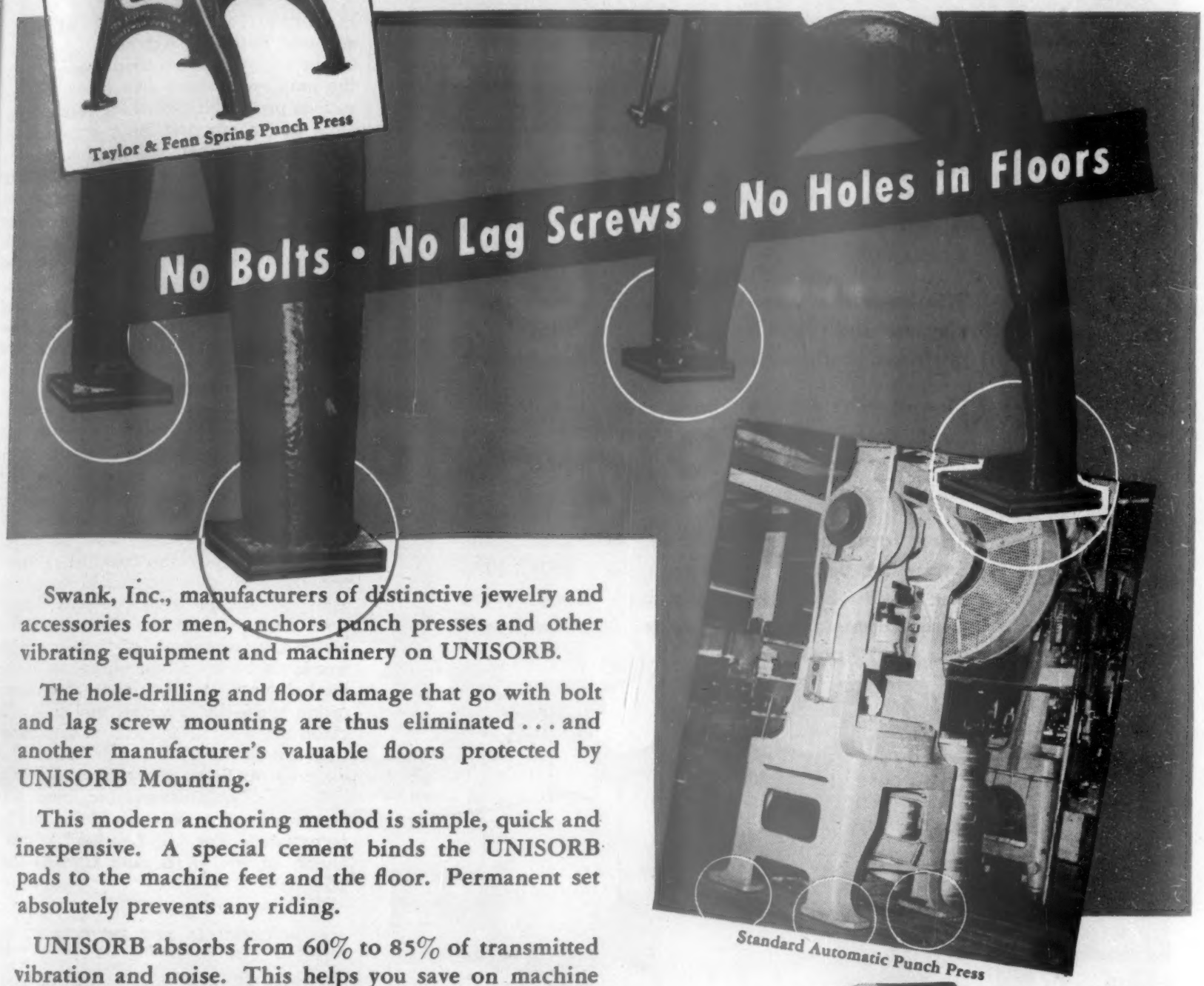
Stewart IRON and WIRE FENCES

Taylor & Fenn Spring Punch Press

SWANK Eliminates Costly Floor Damage by Mounting Punch Presses on UNISORB



Swank, Inc., manufacturers of distinctive jewelry and accessories for men, anchors punch presses and other vibrating equipment and machinery on UNISORB.

The hole-drilling and floor damage that go with bolt and lag screw mounting are thus eliminated . . . and another manufacturer's valuable floors protected by UNISORB Mounting.

This modern anchoring method is simple, quick and inexpensive. A special cement binds the UNISORB pads to the machine feet and the floor. Permanent set absolutely prevents any riding.

UNISORB absorbs from 60% to 85% of transmitted vibration and noise. This helps you save on machine repairs and building maintenance, helps you provide employees with quieter surroundings — and helps them work more efficiently.

Send for sample and complete specifications.

Writes Swank, Inc.: "We are satisfied users of UNISORB, which we are using for anchoring power presses, automatic stamps, foot presses, exhaust blowers, dryers, tubbing equipment and motors. We have applied UNISORB to wood and cement floors, and also to tile. We do not hesitate to recommend UNISORB for the uses to which we have put it.

Standard Automatic Punch Press

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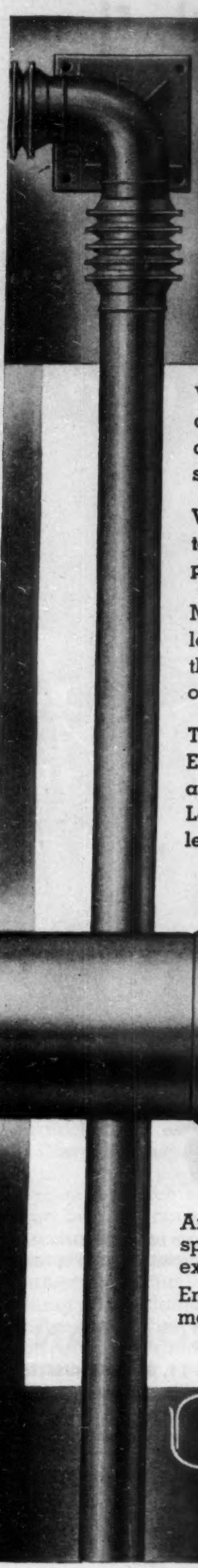

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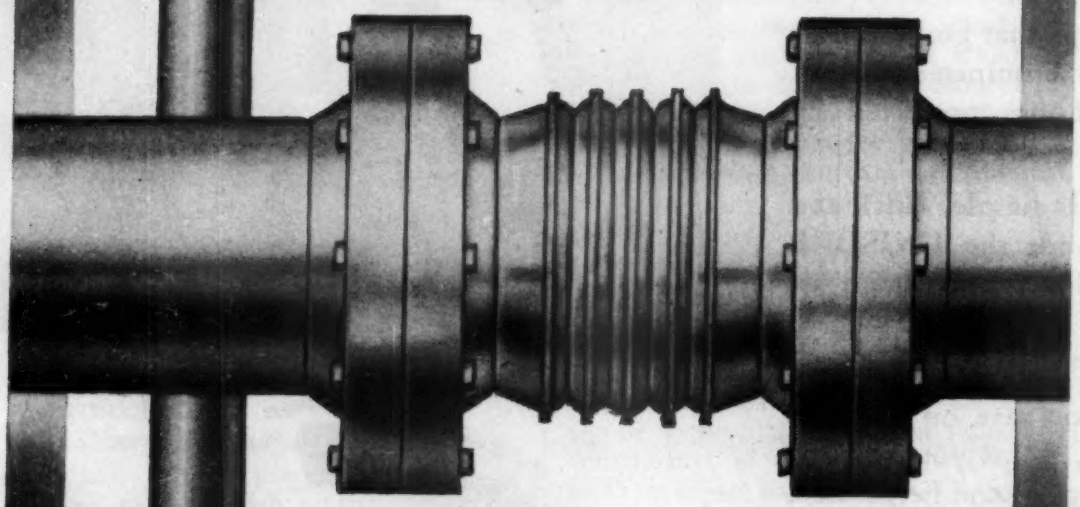
for every piping need

Whether the pipes in your plant carry corrosive chemicals at ten pounds pressure or steam at a thousand—they are subject to tremendous stresses.

Whatever the size—or operating pressure—or temperature—your best bet to protect piping is packless, ringless MagniLastic Expansion Joints.

MagniLastic Joints will save on space . . . installation time . . . maintenance costs . . . prolong the life of pipe, valves and fittings . . . and then outlast the system itself.

There are six standard lines of MagniLastic Expansion Joints: 25# Copper, 55#, 150#, 400# and 1000# Stainless Steel, and Low-Pressure Large-Diameter Joints in Copper, Monel or Stainless to 72" pipe size.



Anchor, Offset, Jacket and Turbo Joints, plus special units made to order, take care of the extraordinary conditions.

Engineering assistance for individual replacements to complete piping layouts is available.

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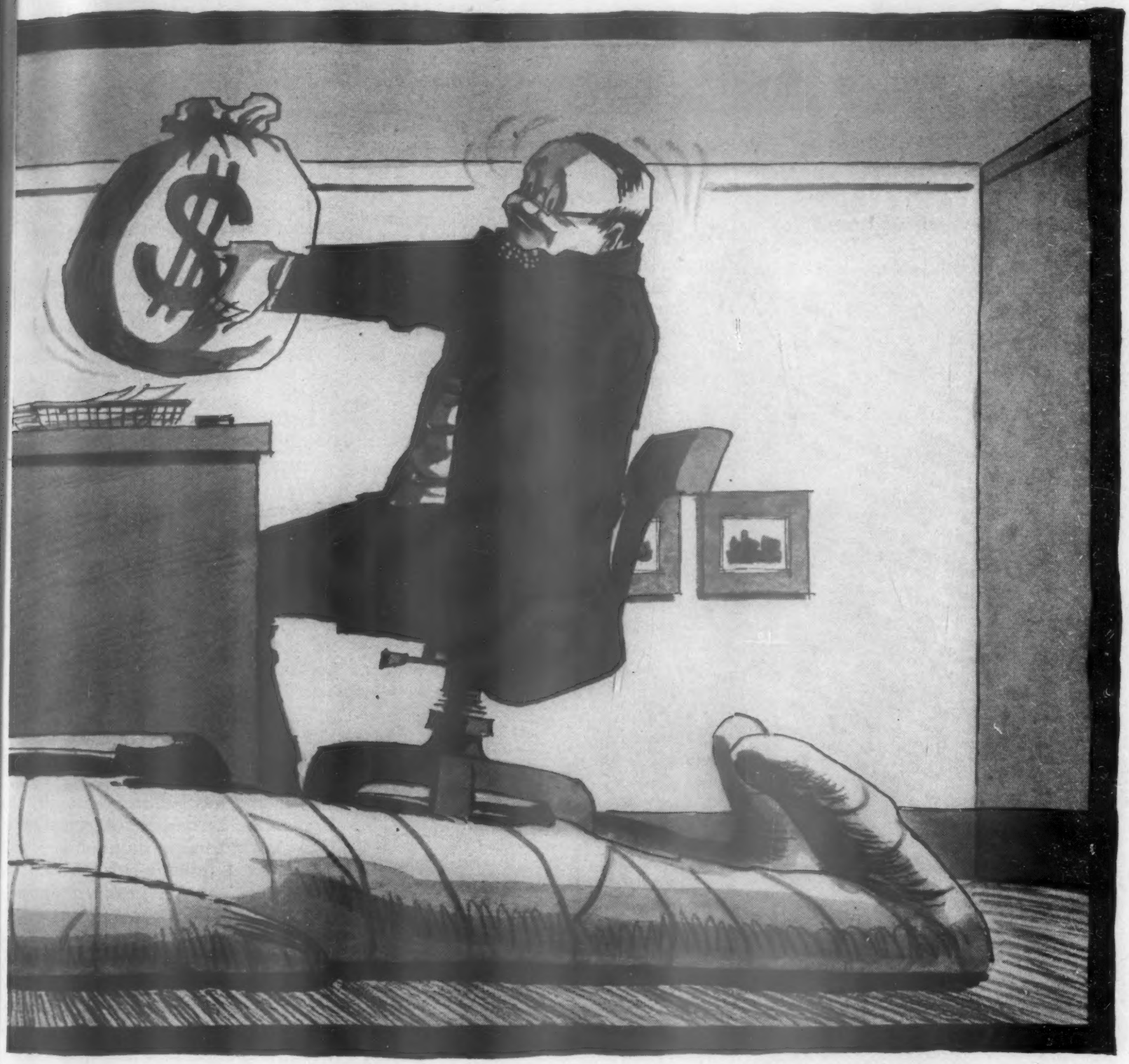
(A SINCERE AD) by Mr. Friendly



"But 20% savings and the greatest extra in insurance aren't all you get! We have a reputation for settling claims quickly and fairly . . . and that service stretches from coast to coast . . .

"And that's still not all. Our All-American Plan* offers you a quick, easy way to get complete coverage — all lines — at costs that no one can beat . . .

"And, even that's not all. We . . ."

"Stop!" said the prospect. "You can not. You simply can not afford to do more. It's wonderful . . . It's grand." "It's American Mutual," said Mr. Friendly happily.

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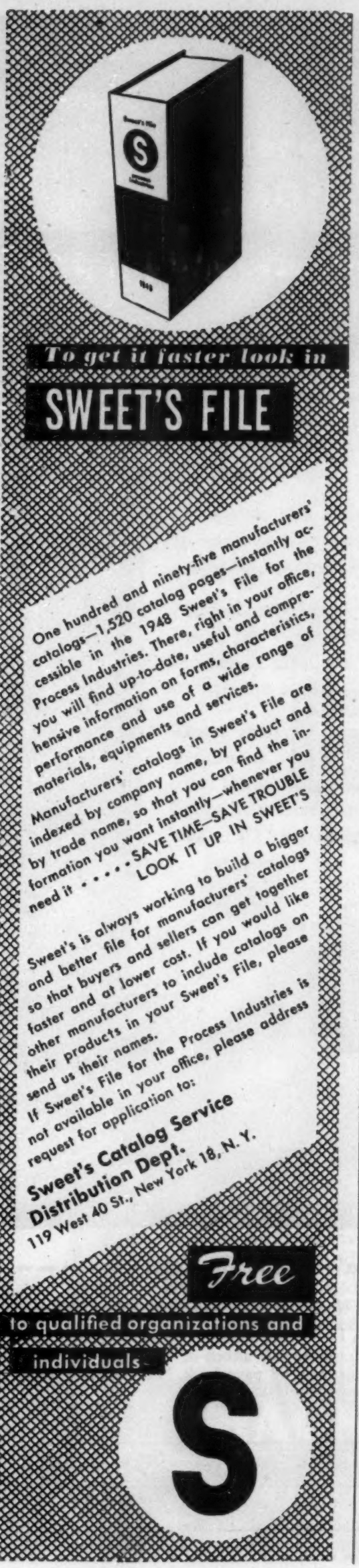
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THEY SAY AND DO

TIME-STUDY UNION GETS NLRB BACKING

The National Labor Relations Board recently ruled to order the Worthington Pump Company, Holyoke, Mass., to bargain collectively with the Time and Motion Study Association, an independent union representing its 17 time-study experts.

Basis for the action was a ruling by the Board that time-study men were professional employees and were entitled to union recognition and government protection as provided by the Taft-Hartley Act.

The decision established the first professional employees unit under the new labor law. At issue was the question of which employees constitute a part of management. The company argued that the employees were not covered by the Act because they exercised certain management functions.

WELDMENT MANUFACTURERS ASSOCIATION FORMED

The newly formed American Weldment Manufacturers Association, an organization of contract welding shop operators, announces it will develop standards in design and manufacturing procedure of weldments to be used as components of machinery.

The association will operate to achieve the following objectives:

1. Stimulate growth and improvement of the weldment manufacturing industry from engineering and commercial standpoints; expand its possibilities, further establish its rightful position in industry, and develop a wider market for its products.

2. Collect, and disseminate to its members, statistics and information of value on such matters as capacities, facilities, improved processes, personnel relations, etc., to the end that those engaged in weldment manufacturing may conduct their business more intelligently.

3. Promote the establishment and improvement of standardized weldment designs, specifications, manufacturing procedures, and applications.

4. Promote, among its members, a spirit of voluntary cooperation for improved production and increased application of machinery weldments, conduct technical, business, and market research; maintain a high standard of product quality; render a better service to ultimate consumers and the public.

5. Through publicity, promote a better understanding on the part of users of weldments of factors influencing various manufacturing practices and costs, and inform prospective purchasers of advantages to be gained through proper application of weldments.

6. Develop full and fair competitive opportunities to both members and non-members of the association.

There are three classes of memberships—company, associate, and academic.

In the final session of the two-day organization meeting, the following officers were elected:

K. F. Ode, The Falk Corporation, Milwaukee, president; W. C. Simpson, Lukenweld, Inc., Coatesville, Pa., vice-president; Hugh Hodges, Graver Tank & Manufacturing Company, Inc., East Chicago, Ind., secretary; A. S. Fredrickson, Lakeside Bridge & Steel Company, Milwaukee, treasurer.

WELFARE FUNDS UNDER THE TAFT-HARTLEY LAW

Warning has been repeated by the Commerce & Industry Association of New York, Inc., to its members, that no contract involving welfare funds should be entered into without advice of competent counsel.

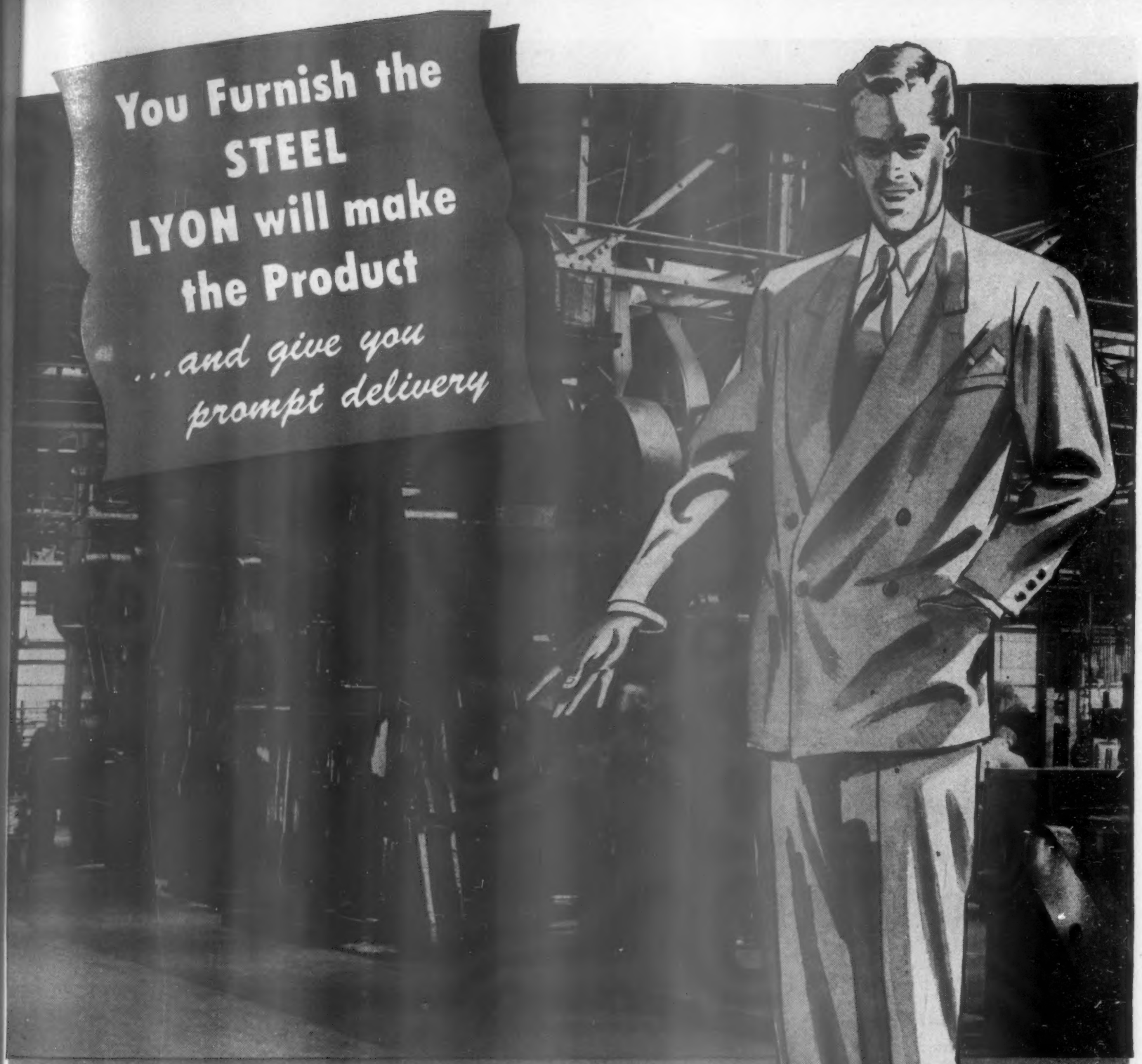
In a special bulletin, the Association cites a particular instance in point, as follows:

The fund is a trusteed plan underwritten by two prominent life insurance companies and a hospitalization fund. It is of some importance to observe the manner in which violation of the Taft-Hartley Act is accomplished.

The violation is evidenced in the following abstract from a circular (name of labor organization deleted):

"WHEN YOU BECOME INSURED,

If you are a member of ——— and are a full-time employee of an employer under the contract with the union who agrees to contribute to the union insurance fund, you will be-



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Here's how you can speed up plant expansion, boost production, or turn surplus steel inventory into cash.

(1) If you can supply us with 12 to 24 gauge sheet steel, we will supply you pound for pound with any selection of Lyon standard products now in production.

(2) We will manufacture to specifications, in Lyon Production run quantities, assemblies, sub-assemblies, or parts in gauges No. 8 and lighter up to No. 30. . . . Write or phone your nearest Lyon dealer or district office.

LYON METAL PRODUCTS, INCORPORATED
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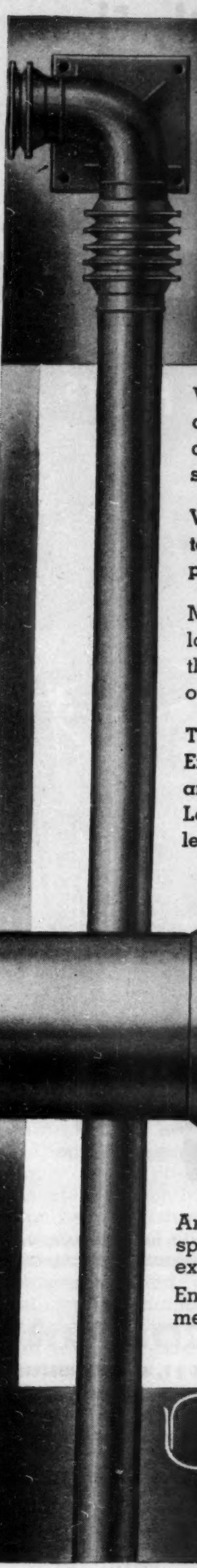
• Lockers	• Display Equipment	• Cabinet Benches	• Bench Drawers	• Shop Boxes	• Service Carts	• Tool Trays	• Tool Boxes
• Wood Working Benches	• Hanging Cabinets	• Folding Chairs	• Work Benches	• Bar Racks	• Hopper Bins	• Desks	• Sorting Files
• Economy Locker Racks	• Welding Benches	• Drawing Tables	• Drawer Units	• Bin Units	• Parts Cases	• Stools	• Ironing Tables



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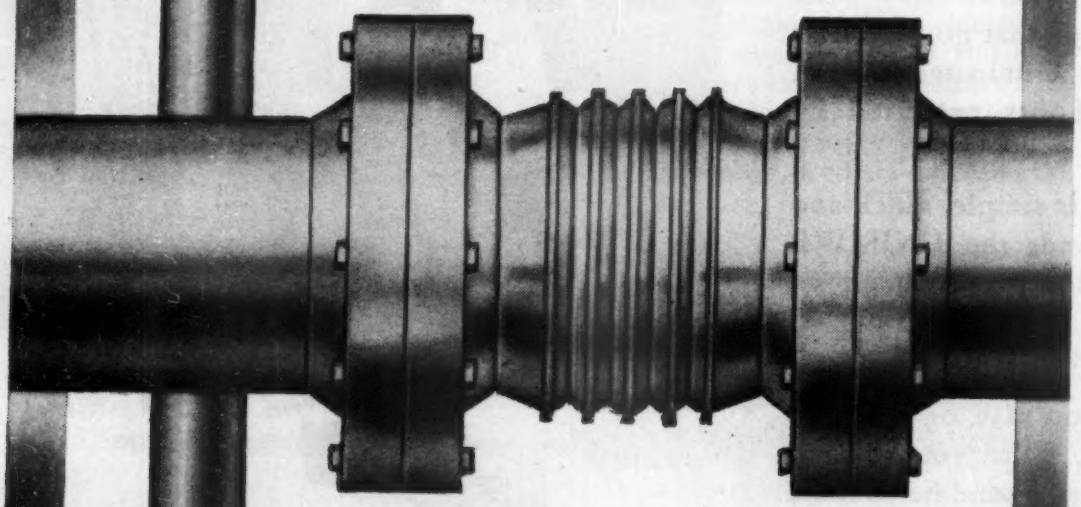

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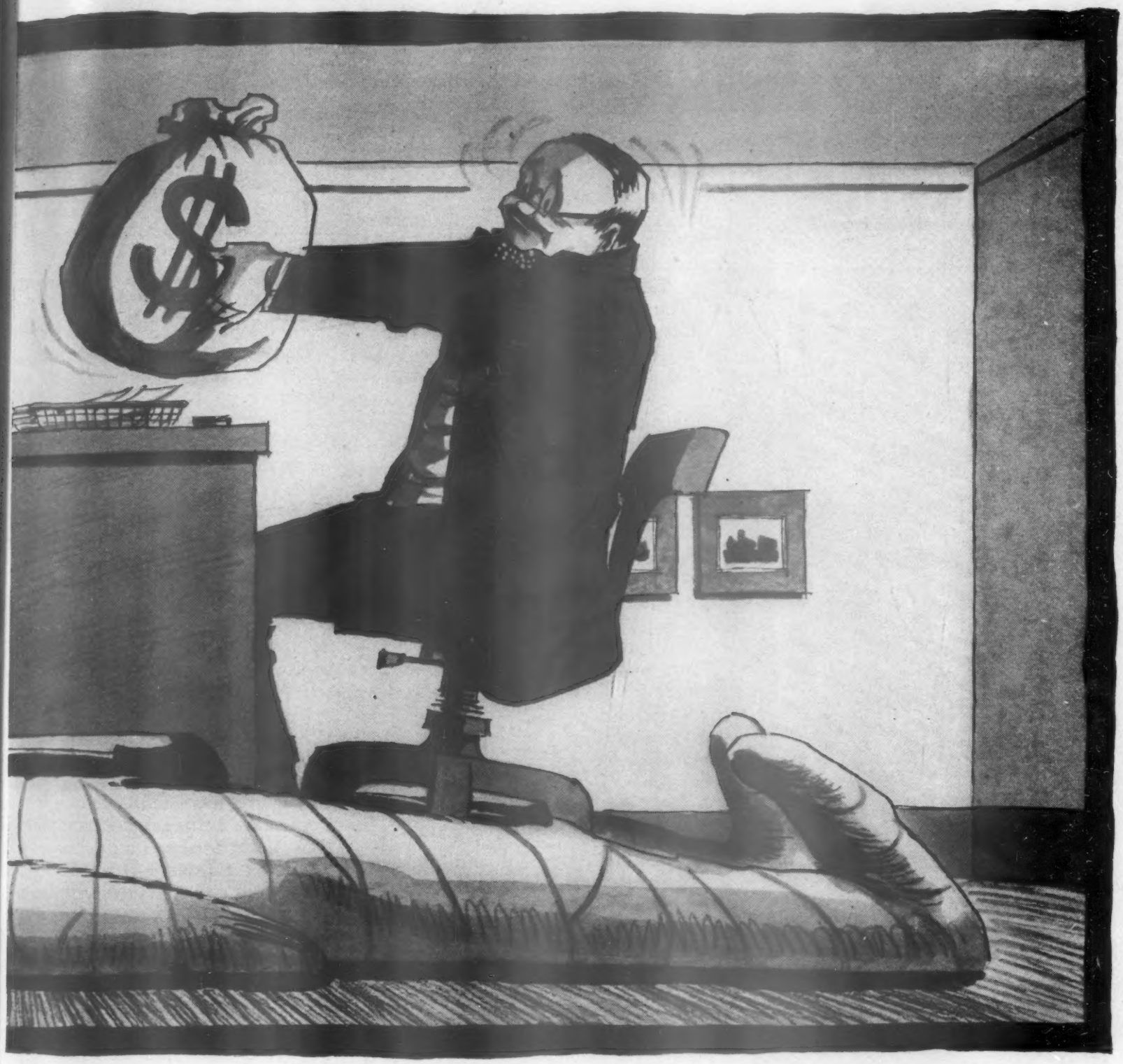

"But 20% savings and the greatest extra in insurance aren't all you get! We have a reputation for settling claims quickly and fairly . . . and that service stretches from coast to coast . . .

"And that's still not all. Our All-American Plan* offers you a quick, easy way to get complete coverage — all lines — at costs that no one can beat . . .

"And, even that's not all. We . . ."

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to qualified organizations and individuals

THEY SAY AND DO

TIME-STUDY UNION GETS NLRB BACKING

The National Labor Relations Board recently ruled to order the Worthington Pump Company, Holyoke, Mass., to bargain collectively with the Time and Motion Study Association, an independent union representing its 17 time-study experts.

Basis for the action was a ruling by the Board that time-study men were professional employees and were entitled to union recognition and government protection as provided by the Taft-Hartley Act.

The decision established the first professional employees unit under the new labor law. At issue was the question of which employees constitute a part of management. The company argued that the employees were not covered by the Act because they exercised certain management functions.

WELDMENT MANUFACTURERS ASSOCIATION FORMED

The newly formed American Weldment Manufacturers Association, an organization of contract welding shop operators, announces it will develop standards in design and manufacturing procedure of weldments to be used as components of machinery.

The association will operate to achieve the following objectives:

1. Stimulate growth and improvement of the weldment manufacturing industry from engineering and commercial standpoints; expand its possibilities, further establish its rightful position in industry, and develop a wider market for its products.

2. Collect, and disseminate to its members, statistics and information of value on such matters as capacities, facilities, improved processes, personnel relations, etc., to the end that those engaged in weldment manufacturing may conduct their business more intelligently.

3. Promote the establishment and improvement of standardized weldment designs, specifications, manufacturing procedures, and applications.

4. Promote, among its members, a spirit of voluntary cooperation for improved production and increased application of machinery weldments; conduct technical, business, and market research; maintain a high standard of product quality; render a better service to ultimate consumers and the public.

5. Through publicity, promote a better understanding on the part of users of weldments of factors influencing various manufacturing practices and costs, and inform prospective purchasers of advantages to be gained through proper application of weldments.

6. Develop full and fair competitive opportunities to both members and non-members of the association.

There are three classes of memberships—company, associate, and academic.

In the final session of the two-day organization meeting, the following officers were elected:

K. F. Ode, The Falk Corporation, Milwaukee, president; W. C. Simpson, Lukenweld, Inc., Coatesville, Pa., vice-president; Hugh Hodges, Graver Tank & Manufacturing Company, Inc., East Chicago, Ind., secretary; A. S. Fredrickson, Lakeside Bridge & Steel Company, Milwaukee, treasurer.

WELFARE FUNDS UNDER THE TAFT-HARTLEY LAW

Warning has been repeated by the Commerce & Industry Association of New York, Inc., to its members, that no contract involving welfare funds should be entered into without advice of competent counsel.

In a special bulletin, the Association cites a particular instance in point, as follows:

The fund is a trusteed plan underwritten by two prominent life insurance companies and a hospitalization fund. It is of some importance to observe the manner in which violation of the Taft-Hartley Act is accomplished.

The violation is evidenced in the following abstract from a circular (name of labor organization deleted):

"WHEN YOU BECOME INSURED,

If you are a member of ——— and are a full-time employee of an employer under the contract with the union who agrees to contribute to the union insurance fund, you will be-

...ON STANDARD PRODUCTS LISTED BELOW
...ON CONTRACT PRODUCTION OF SHEET STEEL ITEMS IN GAUGES FROM 8 TO 30

Here's how you can speed up plant expansion, boost production, or turn surplus steel inventory into cash.

(1) If you can supply us with 12 to 24 gauge sheet steel, we will supply you pound for pound with any selection of Lyon standard products now in production.

(2) We will manufacture to specifications, in Lyon Production run quantities, assemblies, sub-assemblies, or parts in gauges No. 8 and lighter up to No. 30. . . . Write or phone your nearest Lyon dealer or district office.

LYON METAL PRODUCTS, INCORPORATED
General Offices: 212 Monroe Ave., Aurora, Ill.
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A PARTIAL LIST OF LYON PRODUCTS

• Shelving	• Kitchen Cabinets	• Filing Cabinets	• Storage Cabinets	• Conveyors	• Tool Stands	• Flat Drawer Files	
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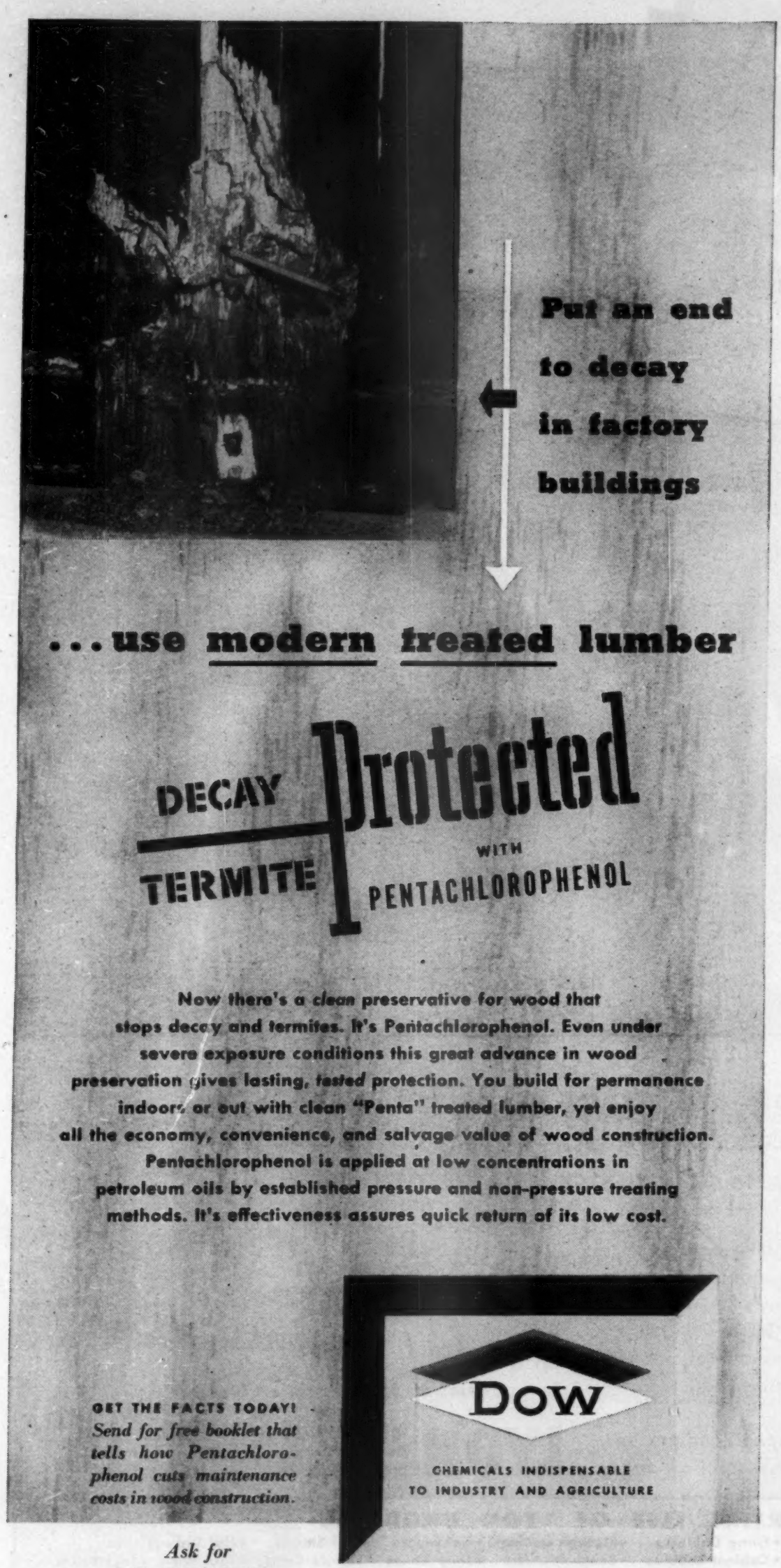
• Wood Working Benches	• Hanging Cabinets	• Folding Chairs	• Work Benches	• Bar Racks	• Hopper Bins	• Desks	• Sorting Files
• Economy Locker Racks	• Welding Benches	• Drawing Tables	• Drawer Units	• Bin Units	• Parts Cases	• Stools	• Ironing Tables


Put an end
to decay
in factory
buildings
...use modern treated lumber
DECAY
TERMITE
Protected
WITH
PENTACHLOROPHENOL
Now there's a clean preservative for wood that
stops decay and termites. It's Pentachlorophenol. Even under
severe exposure conditions this great advance in wood
preservation gives lasting, tested protection. You build for permanence
indoors or out with clean "Penta" treated lumber, yet enjoy
all the economy, convenience, and salvage value of wood construction.
Pentachlorophenol is applied at low concentrations in
petroleum oils by established pressure and non-pressure treating
methods. It's effectiveness assures quick return of its low cost.
GET THE FACTS TODAY!
Send for free booklet that
tells how Pentachloro-
phenol cuts maintenance
costs in wood construction.
DOW
CHEMICALS INDISPENSABLE
TO INDUSTRY AND AGRICULTURE
Ask for
Booklet PE 39.
THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

come insured on the date such agreement takes effect.

"If you are a member of the ——, and are hired as a full-time employee of an employer whose union contract already provides for contributions to the union insurance fund, you will become insured when you complete two months of continuous service.

"In the event you are not actively at work on the date your insurance would otherwise become effective, you will become insured on the day you return to active service."

From a reading of this circular, the legal defect in such a plan appears to be that its benefits are conditioned upon membership in the union, whereas the intent of the Taft-Hartley Act evidently is to require non-discriminatory treatment of union members and non-union employees. Section 7 guarantees the right of organization and its corollary, the right to refuse to participate in organization, and the employer is prohibited by Section 8 (a) (3) from interfering with this right "by discrimination in regard to . . . any term or condition of employment."

That the particular plan under examination runs afoul of the Act is fairly evident from a section of the descriptive brochure which reads, in part:

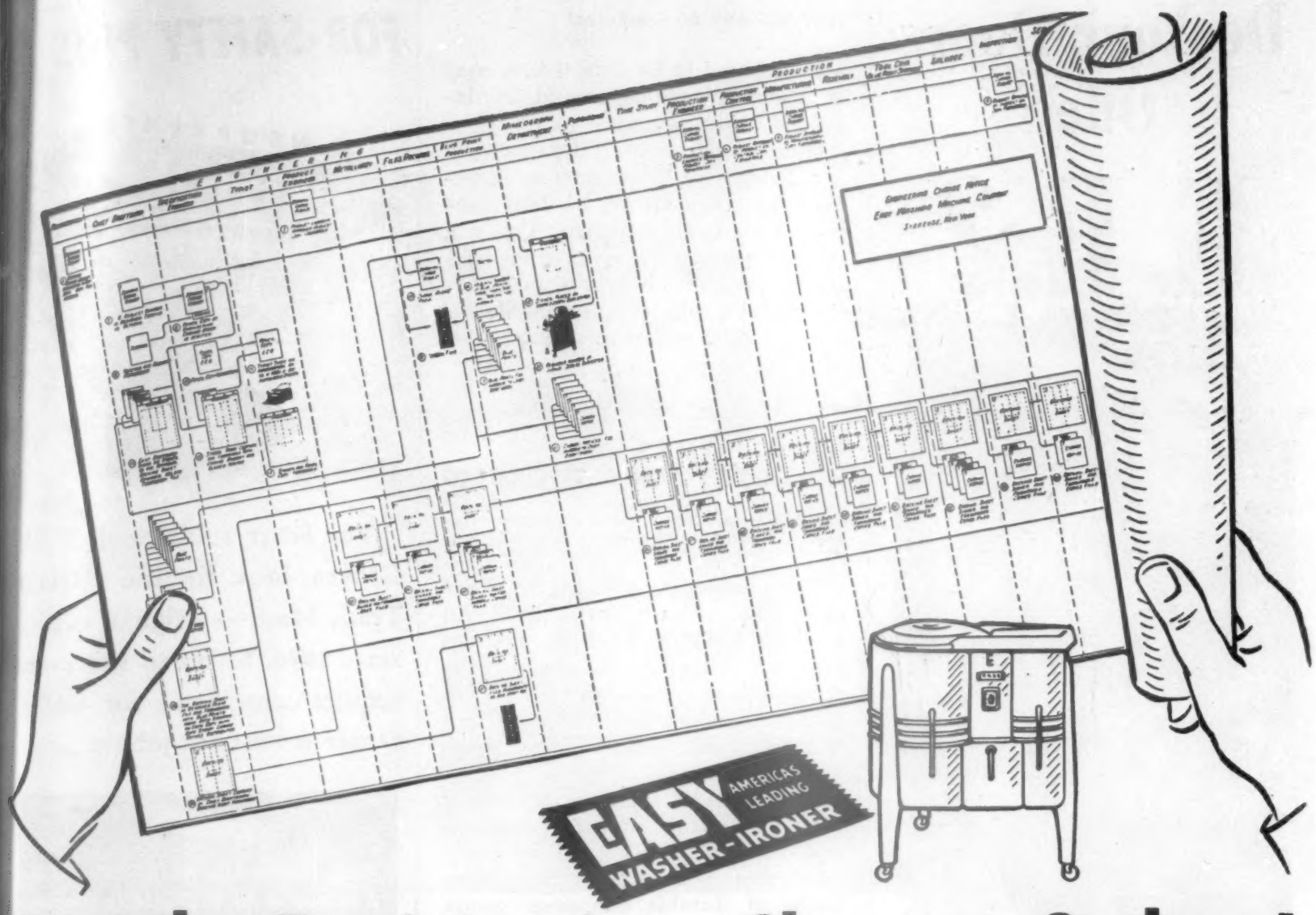
"Your insurance under this plan will end . . . if your membership with the local union is ended for any reason."

Among the civil consequences there may be the liability to pay to employees who are not members of the fund an amount equivalent to the contribution paid on behalf of employees who are union members.

Legality a Weak Argument

When demand for a welfare plan is made, and the employer is unwilling to contribute to the plan for any reason, it is generally unwise to rest the argument solely on the question of legality, because if the question of legality is resolved adversely to the employer he will be under a moral obligation to accede to the union demand, states the bulletin. It is more advantageous, therefore, to oppose the demand on the true grounds—namely, that the employer is unwilling to enter into such an agreement.

When such demand is made the best course of action is to assert, first, the employer's unwillingness to enter into any such plan, and, second, to obtain a verbatim copy of the proposed trust agreement for examination by the employer's counsel. If the



Speeds Engineering Change Orders!

Flow chart tells how Mimeograph brand duplicator and supplies helped speed up Engineering Change Orders for leading washing machine manufacturer.

New postwar models . . . big consumer demand . . . a 70-year reputation for top-notch engineering to maintain.

No wonder Easy Washing Machine Corp., Syracuse, New York, wanted even greater speed and accuracy in getting out its Engineering Change Orders.

And Easy got what it wanted when executives picked the Mimeograph brand duplicator and Mimeograph brand die-impressed stencils to help solve this problem. Savings, too, in "real money" amounts.

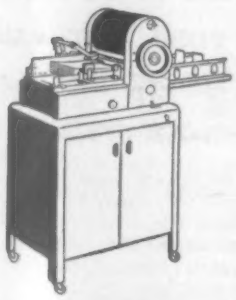
Increased accuracy—all orders are typed directly on a Mimeograph brand stencil, which has been previously die-impressed with standard form. Engineer and chief draftsman sign the stencil as approval. Only one proof-reading required, for all copies are identical.

Increased efficiency—every department gets its own "original" copy of the Change Order with blueprint of change. Department heads sign the backing of the Mimeograph brand die-impressed stencil as permanent file record of receipt of change.

Clear-cut, black-and-white copy—high readability stands up even under adverse handling in shops.

Low-cost duplication—savings in time and labor in preparing Change Orders are more than enough to make the Mimeograph brand duplicator pay for itself in remarkably short order.

This case history is not unusual—it is typical of the way Mimeograph duplication and our trained duplicating experts work with you to save money, speed up paper work. Call the nearest distributor, or write us direct, for help on your specific problems.



FREE! Complete case study of the Easy Washing Machine Change Order problem—including the flow chart reproduced above—plus samples of finished order and the Mimeograph brand die-impressed stencil that did the work. It's free! Clip and mail the coupon today.

The Mimeograph brand duplicator
is made by
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Send me a copy of your case study of the Easy Washing Machine Engineering Change Order problem.

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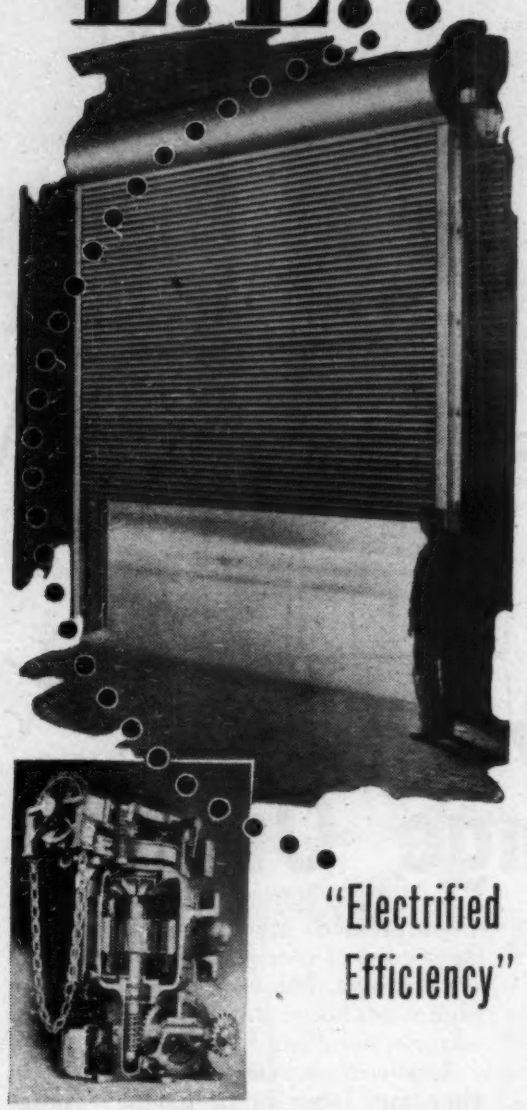
CITY_____ STATE_____

Do Your Doors Offer E.E.?



"Electrified Efficiency"

With the "electrified efficiency" of Motor Operated Kinnear Rolling Doors, you can speed up deliveries, keep door traffic moving faster, save time and labor, cut heating and air-conditioning costs by making it *easy* to close doors *promptly.* Push-button controls for each door can be placed at any point, with additional remote control switches if needed. In addition, these rugged, all-steel, upward-acting doors save *usable* floor and wall space . . . coil out of the way overhead, safe from wind or vehicles . . . add to fire and theft protection . . . stand up longer, with less care, under hardest use. Built to fit any opening in old or new buildings. Write:

The KINNEAR MANUFACTURING CO.
FACTORIES
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Offices and Agents in Principal Cities

KINNEAR ROLLING DOORS

plan is found to be defective, a copy of counsel's opinion should be delivered to the union.

On the other hand, if the employer is willing to enter into such an agreement, it should always be done subject to approval of counsel. This will tend to remove the issue from bargaining and throw it into the hands of counsel where it can be handled as a legal matter rather than as a matter of bargaining.

WAGES, PRICES, AND STABILITY FORECAST FOR 1948

SUMNER H. SLICHTER, Lamont Professor, Harvard University, speaking before American Management Association

The economists who expect a recession in the early part of 1948 will turn out to be mistaken. Inventories are small in relation to sales, and the accumulation of inventory is not likely to precipitate a recession. Both business debts and consumer debts are small in relation to incomes. A recession is not likely to start from a drop in the rate at which business and consumer debts are incurred. The needs for housing, for many forms of durable consumer goods, and for industrial equipment, are large and pressing. Demand in this field is likely to persist even in the face of unfavorable developments. A substantial drop in net foreign investment is a possibility, though such a drop would have little effect upon the domestic economy provided it occurs within the next few months, while the demand for goods is in excess of supply and while industry has huge backlogs of orders.

The following seem to me to be the principal elements which will determine the course of business during the first half of 1948:

1. Supplies of foodstuffs will be scarce—definitely scarcer than in 1947.

2. Wages will continue to rise as the third round of wage increases spread throughout the economy. This means that the shortage of foodstuffs will be accompanied by rising incomes.

3. Corporations will continue to disperse a larger proportion of their incomes in the form of dividends, thereby reducing corporate saving, raising individual incomes, and adding to inflationary pressures.

4. The rising prices which will naturally result from the above conditions, will stimulate the future ex-

FOR SAFETY PLUS

For *better* rubberized Work Gloves, look for the HOOD Trade Mark — a sign of quality since 1896. Styles to suit every requirement. Send for folder. Order from your jobber.

HOOD
HOOD RUBBER CO., WATERTOWN, MASS.
A Division of the B. F. Goodrich Company

WATCHMEN ARE HUMAN. HUMANS ARE WEAK. THAT'S WHY IT IS WISE TO GIVE YOUR WATCHMAN THE MECHANICAL SUPERVISION OF A DETEX WATCHCLOCK SYSTEM.

DETEX GUARDSMAN points an accusing finger at the shirker and round-skipper. The GUARDSMAN carries a two weeks' supply of tape—for day and night registration. Write for descriptive folder.

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DETEX WATCHCLOCK CORPORATION
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76 VARICK STREET, NEW YORK 13, N.Y.
Sales and Service in All Principal Cities

"$5.00 a day for mechanics? ...the man is mad!"

● Thirty-four years ago, a famous industrialist announced a five-dollar minimum daily wage. Industry was dumbfounded! How could a man pay such high wages and still make a profit? *But he did . . . by cutting corners* in production, he built an industrial empire!

Today, rising labor and material costs are pushing *your* "break-even" point to unheard-of percentages. *Your* future profits—even survival—can well depend on *how you cut production corners.*

That is where Tinnerman SPEED NUTS can help you. No matter what you manufacture, there is a very good possibility that you can begin to cut cost and time corners in assembly operation with SPEED NUTS. (Incidentally, the same company that introduced the five-dollar wage 34 years ago now uses SPEED NUTS to save millions of dollars annually.)

Without obligation our engineers will be glad to examine your product and report to you the savings in costs you can expect through the use of SPEED NUTS. In the meantime let us send you our new descriptive catalog.

TINNERMAN PRODUCTS, INC.
2038 FULTON ROAD • CLEVELAND 13, OHIO

In Canada: Dominion Fasteners Limited, Hamilton
In England: Simmonds Aerocessories, Ltd., Treforest
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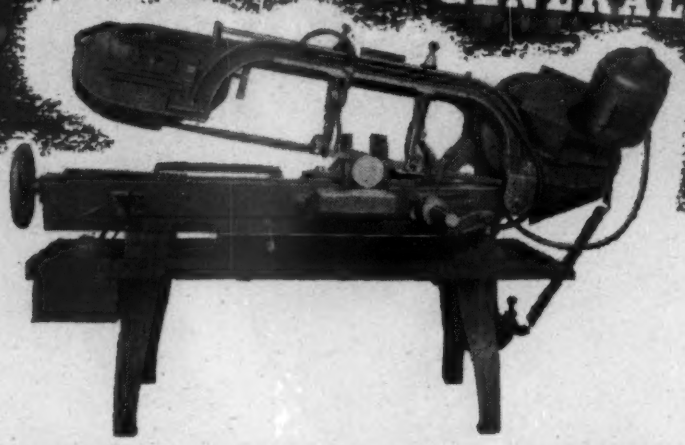
The SPEED NUT principle is incorporated in a complete system of fastenings for metallic and non-metallic parts. The savings are the result of fewer parts, faster application and the elimination of many preparatory operations. Special SPEED NUTS are made when existing SPEED NUTS do not meet all requirements.

Speed FASTEST THING IN FASTENINGS *Nuts*

Patented—Trade Mark Reg. U. S. Pat. Off.

THERE'S A SPEED NUT FOR EVERY FASTENING NEED—MORE THAN 4000 SHAPES AND SIZES

TWO FINE *Metal Cutting Saws*
FOR PRODUCTION AND GENERAL UTILITY



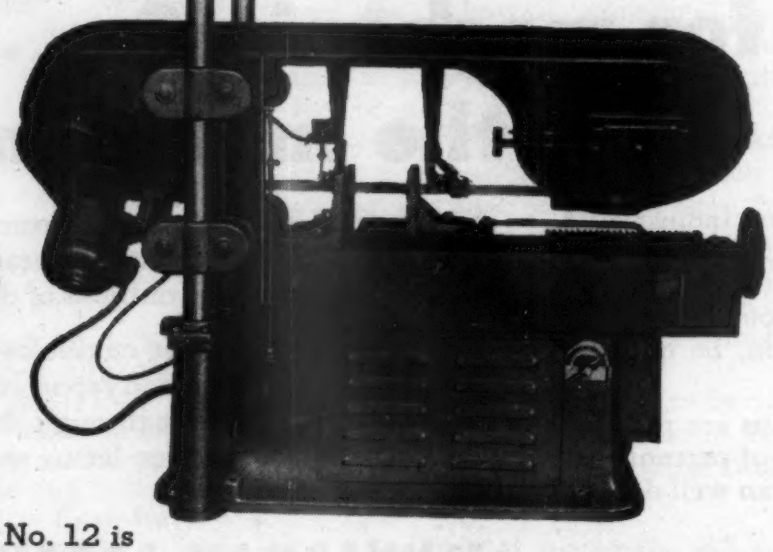
WELLS No. 8

with wet cutting system

Here's a saw that will pay dividends on practically any cut-off job. It's fast, versatile and economical. The wet cutting system illustrated is a low cost extra that makes possible higher cutting speeds and longer blade life.

SPECIFICATIONS

CAPACITY:
Rectangular . . . . . 8" x 16"
Special Guides . . . . 5" x 24"
Rounds . . . . . 8" O.D.
MOTOR . . ½ H. P., A. C., or D. C.
SPEEDS
Selective; 60, 90, 130 ft. per min.
WEIGHT . Approximately 665 lbs.



WELLS No. 12

with automatic cutting cycle

The new Wells No. 12 is an electrically powered, hydraulically controlled saw. Just push a button and the head comes down and makes the cut at a controlled blade pressure. At the completion of the cut the head returns to a predetermined position and the motors shut off.

SPECIFICATIONS

CAPACITY:
Rectangular . . . . 12" x 16"
Rounds . . . . . 12¾" O.D.
MOTORS . . . ¾ H. P. and ⅓ H. P.
SPEEDS
Selective; 50, 90, 150 ft. per min.
WEIGHT . Approximately 1750 lbs.

Wells SAWS

Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
1414 TAYLOR ST., THREE RIVERS, MICHIGAN

pansion of business and consumer credit which, in turn, will bring about further price increases.

5. There is a good prospect that Congress will reduce taxes, increasing the amount of money available to buy goods, and accentuating the rise in prices. The rise in prices will, of course, increase the demand for a third round of wage increases. Thus, the more that Congress reduces taxes, the greater will be the demand for wage increases.

More effective in limiting the rise in the cost of living than a restriction of bank credit would be arrangements for directly reducing consumer demand for goods.

Could people be induced to buy about $8,000,000,000 of Class E bonds a year in excess of redemptions—or even $4,000,000,000 or $6,000,000,000? Most people will promptly say that, at present commodity prices, they cannot afford to buy government savings bonds. It would be more realistic, of course, for them to say that at present prices they cannot afford *not* to buy bonds. By not buying bonds, they keep the commodity prices up.

A radical improvement in government savings bonds is required. This improvement should encourage people to hold their present bonds as well as to buy new ones. The most practical improvement, I think, would be to make government savings bonds payable in purchasing power, rather than in dollars. In other words, instead of giving the holder of Class E bonds $4 at maturity for every $3 he paid, let him be given $4 in terms of the purchasing power of the dollar as of the date of his bond purchase. This means that if the price level doubled between purchase and maturity, the bondholder would be given $8 for every $3 spent for the bond. On the other hand, if the price level were to fall by half, he would be given $2 for every $3 he spent for the bond.

Millions of persons who bought government savings bonds in 1942, 1943, 1944, and even 1945, could not get back today as much purchasing power as they put into the bonds. Obviously, this injustice to millions of bondholders needs to be corrected.

Let us suppose that the government is successful in halting the rise in prices. Is that the end of the matter? In another year's time, will not the unions be seeking a fourth round of wage increases? Possibly technological progress will be sufficiently rapid so that industry can satisfy the de-

Your Everyday Piping Needs
Now Filled from Local Stocks

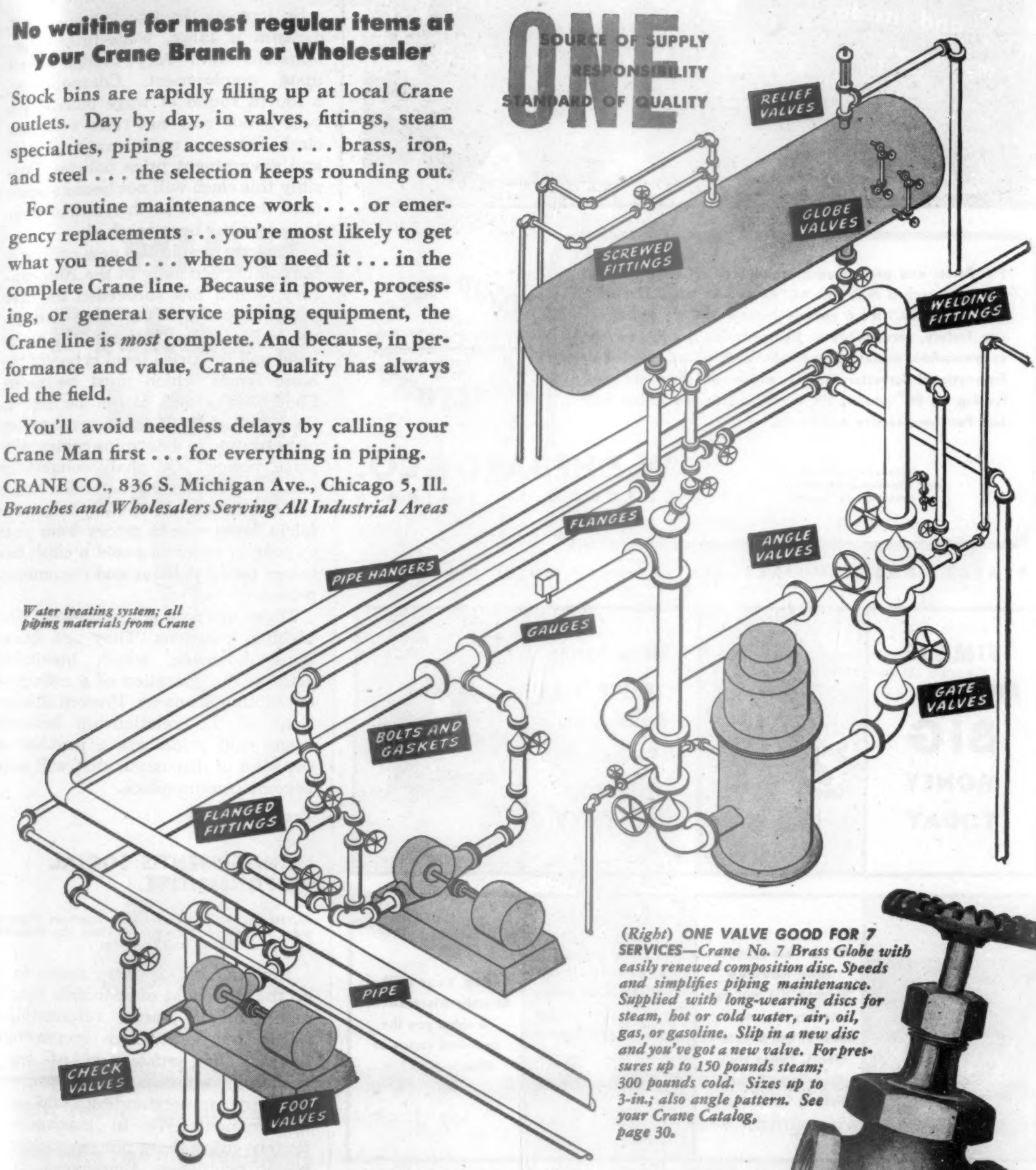
No waiting for most regular items at your Crane Branch or Wholesaler

Stock bins are rapidly filling up at local Crane outlets. Day by day, in valves, fittings, steam specialties, piping accessories . . . brass, iron, and steel . . . the selection keeps rounding out.

For routine maintenance work . . . or emergency replacements . . . you're most likely to get what you need . . . when you need it . . . in the complete Crane line. Because in power, processing, or general service piping equipment, the Crane line is *most* complete. And because, in performance and value, Crane Quality has always led the field.

You'll avoid needless delays by calling your Crane Man first . . . for everything in piping.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas



Water treating system; all piping materials from Crane

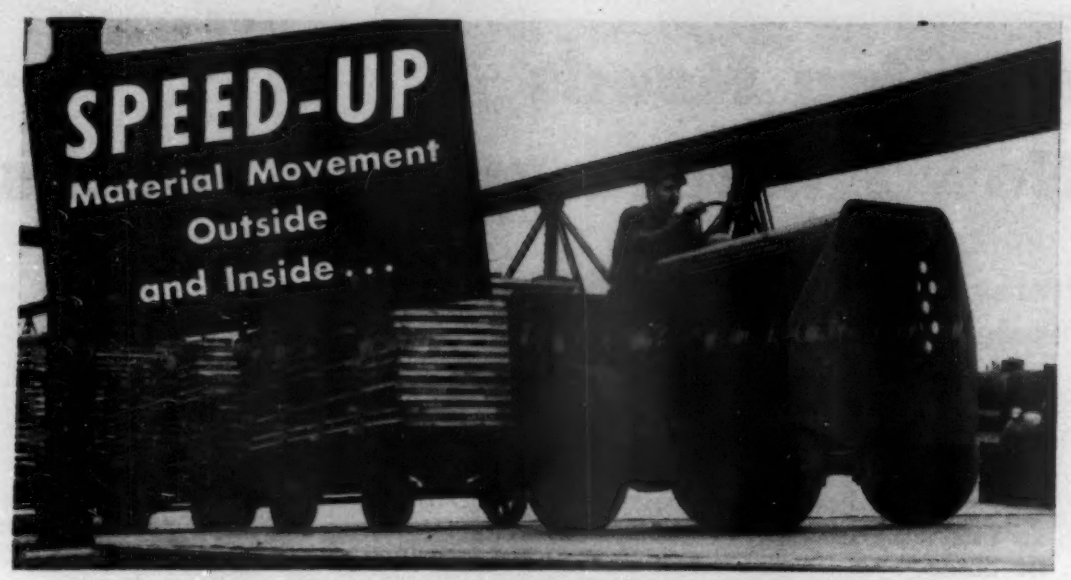
(Right) **ONE VALVE GOOD FOR 7 SERVICES**—*Crane No. 7 Brass Globe with easily renewed composition disc. Speeds and simplifies piping maintenance. Supplied with long-wearing discs for steam, hot or cold water, air, oil, gas, or gasoline. Slip in a new disc and you've got a new valve. For pressures up to 150 pounds steam; 300 pounds cold. Sizes up to 3-in.; also angle pattern. See your Crane Catalog, page 30.*

EVERYTHING FROM . . .

VALVES • FITTINGS
PIPE • PLUMBING
AND HEATING

CRANE

FOR EVERY PIPING SYSTEM



Plus-Power and great maneuverability of **SHOP MULE** tractors have earned their title of "America's Most Versatile Industrial Tractor." It's a general purpose unit for almost any size factory, yard, utility or transportation requirement and accommodates numerous equipment adaptations. Powered by International Harvester 30.5 H.P. engine, full pneumatic tired, turning on 90" radius, it's exactly right—and priced right too. Parts and service *world-wide.*

SHOP MULE INDUSTRIAL TRACTORS

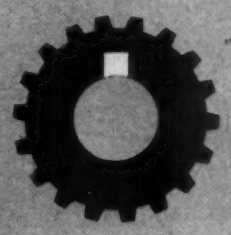
Detailed specifications and illustrated literature sent promptly on request.

W. F. HEBARD & CO.
CHICAGO 16, ILLINOIS

CREATORS AND MANUFACTURERS OF SHOP MULES SINCE 1918

TIME IS MONEY . . . **BIG** MONEY TODAY

How long does it take you to cut a keyway like this?



With This Minute Man Keyway Broach Kit you can cut any keyway by hand in one minute in Gears, Pulley Hubs, Couplings, Collars, Milling Cutters, etc.

Pays For Itself In No Time. Cut a few keyways and this Set and a handy duMont Arbor Press owes you nothing at all.

Ask Your Mill Supply Distributor to show you the complete range of *Minute Man* Kits.

MAIL THIS COUPON
Get the whole story on what this Kit does, how it works, how little it costs.

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Please send me Descriptive Folder and Price List H
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The du MONT CORPORATION
GREENFIELD, MASSACHUSETTS

mands of labor and make a fair profit without raising prices. If technological progress is not sufficiently rapid, there will be a clash between the price policies of the government and the wage policies of the unions.

So long as the backlog of urgent demand is large, wage-price relationships have very limited effect upon employment. Consequently, a fourth round of wage increases a year hence may not raise a serious clash between union wage policies and government price policies. Possibly this clash will not become acute until the fifth or sixth round of wage increases has been reached.

Nevertheless, in the new collective bargaining economy of the 20th century, which has succeeded the free market economy of the 19th century, the relationship between the wage level and the price level is one of the basic issues which must be faced. Shall wages and prices be left to themselves? Shall union wage policy be permitted to determine community price policy? Or shall community price policy determine union wage policy? Shall a community tolerate a fairly rapid rise in prices from year to year in order to avoid a clash between union policies and community price policies?

These are new and somewhat disturbing questions. They are questions, however, which inevitably arise in the operation of a collective bargaining economy. Present discussions of the relationship between wages and prices are a preview of the kind of discussion that will soon become commonplace.

MANAGEMENT'S SOCIAL RESPONSIBILITY

ALVIN E. DODD, President, American Management Association, speaking before the American Society of Mechanical Engineers

Now that this country seems to be on the threshold of economic plenty, management's social responsibility needs to be turned increasingly toward the satisfaction of non-economic aims—status, prestige, integrity, understanding, and self-development. We in management largely enjoy these non-economic or social privileges. Employees, it is true, may use the considerable economic benefits they obtain from their work to satisfy their non-economic needs. Yet higher wages on the job have no more brought industrial peace than higher allowances tie children more closely to their parents.

Remember that approximately half

Aeroquip

HIGH PRESSURE HOSE LINES

TWO PIECES—EACH REPLACEABLE

Assembly without special tools. Detachable end fittings can be reused over 100 times. No adjustment or tightening after assembly.

Hose construction: Tube and cover are made of synthetic rubber, oil and grease resistant, reinforced with two high tensile steel wire braids.

Available in the following sizes: ¼, ⅜, ½, ¾ and 1 inch. These fittings are also available to service all types of greasing equipment.

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JACKSON, MICHIGAN

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Self-Priming Centrifugal Pumps FOR INDUSTRY

Now!

for the first time

AN EFFICIENT SELF-PRIMING CENTRIFUGAL PUMP

SUITABLE FOR MANY INDUSTRIAL REQUIREMENTS

Gorman-Rupp pumps are engineered to meet industrial needs . . . efficient in performance and dependable in operation.

If subjected to a "broken" suction line, or interrupted water supply, they will re-prime and automatically resume pumping when suction supply is restored. This is extremely important and desirable as it eliminates the necessity of expensive installations or positioning the pump at low level to hold its prime.

NO FOOT VALVE IS REQUIRED. The conventional centrifugal pump will retain its priming only when equipped with a foot valve or provided with a flooded suction.

Wells with casing too small in diameter to accommodate the required size foot valve, present no problem for Gorman-Rupp Self-Priming Pumps. Neither do extremely high suction lifts -- lifts up to 25 and 26 feet.

Gorman-Rupps are available in capacities from 50 to 1200 GPM, and are furnished with various forms of drive . . . close-coupled . . . with bed plate and flexible coupling or with V-belt drive for using an available motor.

Write us concerning your pumping problems.
Ask for informative bulletins.

THE GORMAN-RUPP COMPANY

the workers' waking time is spent on the job. Cramp people, bottle them up, deny them the fulfillment of their non-economic aspirations, and you invite trouble. The growth of the union movement took place partly in response to the worker's desire to express himself, to be a real person. The success of some companies adept in developing good human relations has given them the "competitive edge" over their rivals.

But, there is an even more important reason for turning to the non-economic, which I should like to quote from a very remarkable forecast: "The business system must accept its social responsibility and devote itself primarily to service, or the community will ultimately make the attempt to take it over in order to operate it in its own interest.

"The spectacle of the attempt to accomplish this result in eastern Europe is certainly not so attractive as to make us desire to try the same experiment here. Hence, we should act, and act quickly, in the former proposition." This warning was uttered by Henry Laurence Gantt in his last public message before his death in 1919.

What Gantt advocated was less autocracy on the part of employers, a movement toward cooperation, and the widespread use of non-financial as well as financial incentives.

Integrated Interests Needed

In many countries where management has failed to provide its employees with adequate non-financial incentives, the union movement has obtained recognition of its members' non-economic aims at the political polls. If our employees are to continue to accept our economic way of life, we need to integrate our interests with theirs.

How, then, can we escape the tyranny of the belief that the only tie of a worker to his business is the wage he gets and the physical product he turns out? We must provide for all the people in industry what Elton Mayo has so aptly called "growth in capacity." That is, social as well as technical skills, set in the framework of social responsibility. These practices have been studied and tested by a small vanguard of management pioneers, forged in the heat of action in the shops, on the assembly lines, in the offices. May I offer them to the future as a keystone for the complex structure of industrial peace?

I believe that the most important

4 tons suspended in midair!

HERE is the Navy's new transport Helicopter—the Piasecki HRP-1. Suspended in midair, its giant rotors can support four tons of gross weight—can carry nine or ten men to safety in an emergency.

Both of the main rotor transmissions produced by Foote Bros. incorporate "A-Q" (aircraft quality) Gears.

These revolutionary gears achieve a new peak in performance due to the extreme precision—the extraordinary techniques developed in heat treatment—the control of every step in production, from the billet to the finished gear. They offer manufacturers of any type of equipment maximum strength with minimum weight—the advantages of compactness and low noise level. They permit operation at extremely high speeds.

. . . . Foote Bros. "A-Q" Gears may offer your engineers a solution to the problems they face.

. . . . Foote Bros. high-quality Commercial Gears are backed by complete facilities and nearly a century of gear manufacturing experience.

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DALLETT'S RS Series of Pneumatic Hammers are of the valveless type. This lever throttle control model admits a smooth, graduated flow of air while permitting the exhaust air to pass through the bushing to blow away chips and scale.

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single development in the business of the future will be a share for employees in many of the work satisfactions now enjoyed largely or exclusively by those rather high up in management. Of course, management must continue to manage and to insist that business be controlled by those who can insure its revival and growth, and who should be just arbiters among the various claimants to its income. By "just arbiters" I do not mean to imply that managers have inherently any greater sense of justice than employees or stockholders. It is only that a natural process of selection insures that they do not remain managers long if they do not apportion that income fairly. If employees are slighted, the most capable leave for more lucrative fields; and the business loses out in competition in consequence. If a fair proportion of the increased income from technological improvements is not passed on to consumers in the form of lower prices, the result is very similar. And if stockholders are not justly dealt with, the company may find itself cramped for capital.

Security—a Work Satisfaction

However, to return to the work satisfactions which management must now seek to provide, one of the most basic is security.

One aspect of this is mental—a feeling of being treated fairly on the job. Management's past attitude of autocracy has developed in the employee, in many cases, the feeling that only the union can protect him.

Does not this mental insecurity on the part of the employee point to the need for a radical change in the type of foreman we have in industry today? Aren't there too many foremen who are at heart guerilla fighters against their subordinates, whose ability and training are just enough to get by?

A second type of employee insecurity is social. This type stems from management's tendency to do all the talking and none of the listening, from its lack of knowledge of the feelings and opinions of the rank and file, from the failure of superiors to release the thinking of their subordinates, to encourage personal initiative. It is due in part also to the isolation of the employee from companionship, from craftsmanship, from the finished product. Where it exists, management has overlooked the dynamics of consultation, of generosity and patience, and of group work and group incentive.

A third aspect of employee inse-

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At the A.S.T.E. Show in the Cleveland Auditorium in March, you will have the opportunity to learn first-hand the many ways in which Allied's products and services can contribute to lower costs and greater production efficiency in your plant. As a reminder to visit our booth, it is a suggestion that you tear out this advertisement and drop it in the briefcase that you will carry to Cleveland.

If you are unable to attend the Exposition, we will be glad to mail you full information on any or all of the products listed above.

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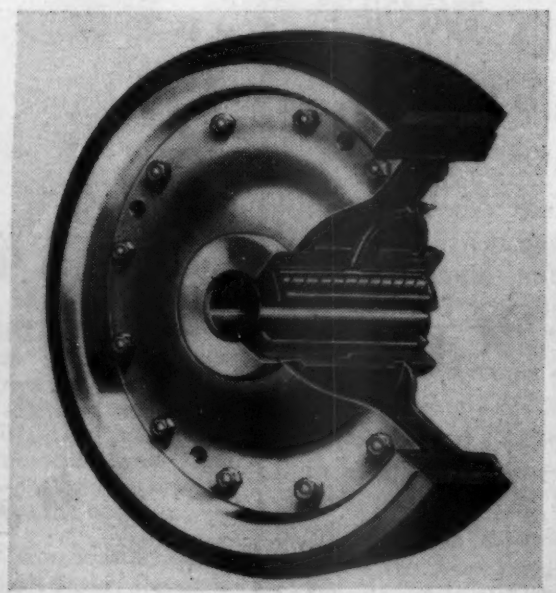

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curity is physical. Repetitive production, standardization of methods of work, uniformity of pace, control of speed by machine work on minutiae, have caused deep-seated psychological dissatisfaction. True scientific management takes account of these phenomena. In the daily practice of the factory, shall we not have to integrate individual motions into a pattern of work?

Encourage Group Participation

Security—mental, social, physical—can we retrieve it? I believe the answer is *yes,* if we can kindle participation by employees in group activity, participation by management in its own development. Or, as Lawrence Appley put it at one of the AMA meetings—if management is getting things done through other people, then management is most importantly the development of people and not the direction of things.

Active group participation by employees in specific areas where they can make a real contribution is one of the mainsprings of industrial peace. It gives employees a more direct concern with the source of their livelihood. They become more responsible on the job if they participate in accident and waste reduction, better attendance and training, control of quality and maintenance, improvement of discipline and job attitude. Employees become more interested in their jobs if they are consulted and rewarded for their ideas on the job. Employees might be less opposed to new methods and other technical changes if these changes were explained, if the fact that they reduced strain and fatigue was made clear. Employees might show better understanding of their jobs if they knew more of management's aims and policies, the economics of the company and industry, if management knew more of what the worker really thinks. If we proceed gradually and in mutual good faith, we may yet develop a pattern for industrial peace.

WORK SIMPLIFICATION ROUND TABLE

In the New York offices of the Bigelow-Sanford Carpet Company, representatives of 45 companies recently participated in a one-day work simplification round table discussion.

The meeting occurred as a result of a desire on the part of some of its participants to continue a relationship begun in a seminar on work

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Borderline Vision*

may be blocking your efforts to cut costs

● BETTER CHECK LIGHTING when you start looking for ways to lower costs. Sometimes lighting *seems* adequate, when actually it results in Borderline Vision . . . just a shade under the optimum for top productivity.

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Don't overlook lighting as an idea for lowering costs. *Wheeler Skilled Lighting* may be one of the most economical means of achieving your objective. Write **Wheeler Reflector Company, 275 Congress St., Boston 10, Mass.** Also branch offices in New York and principal cities.

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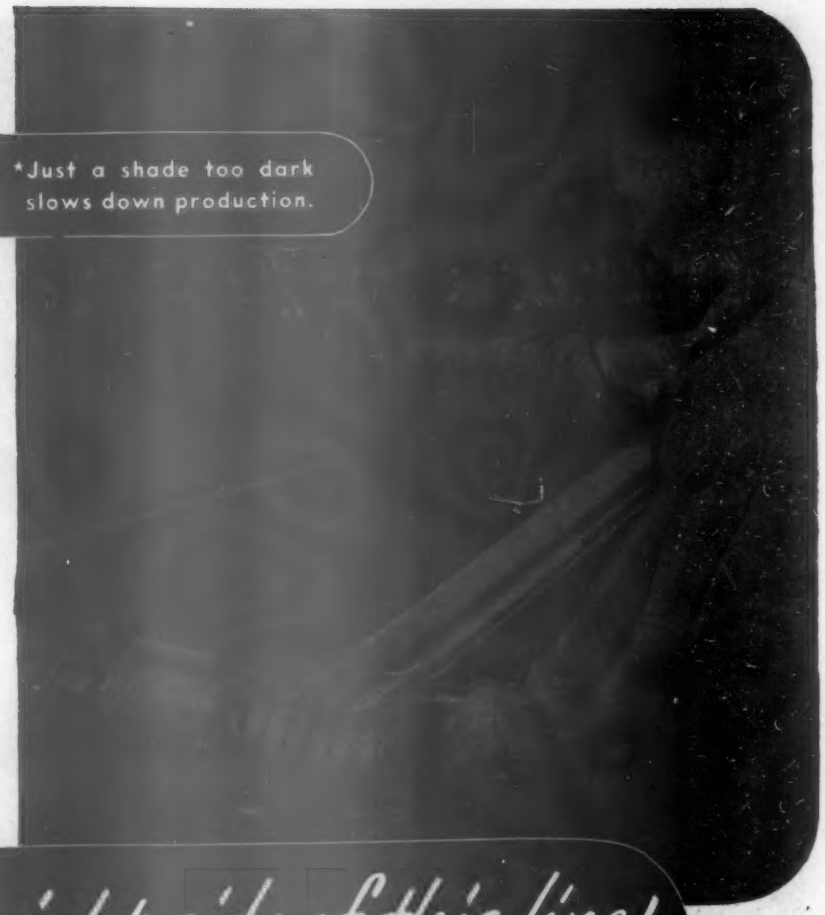

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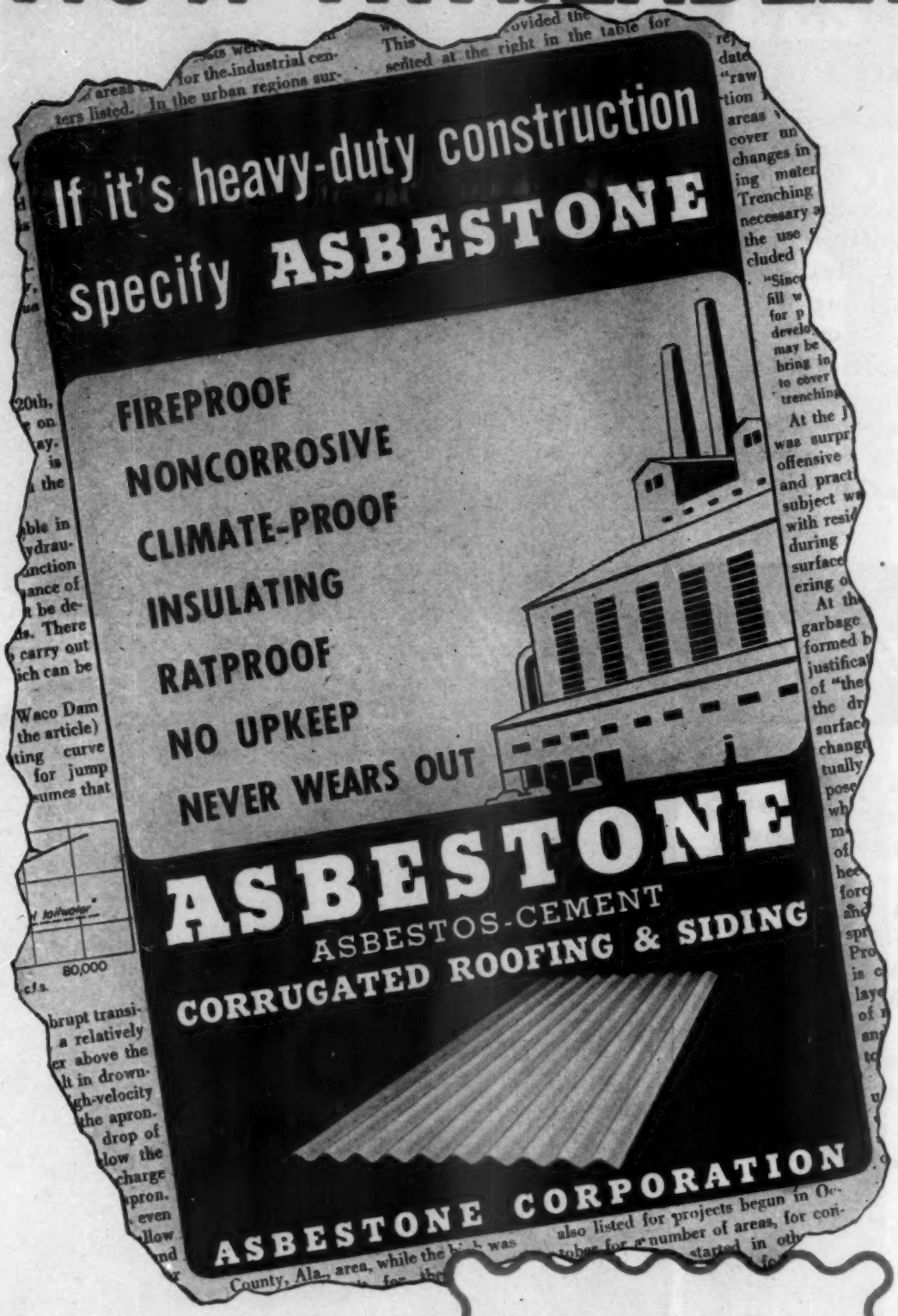

A few of the many industrial leaders who have built with ASBESTONE:

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ASBESTONE production has been concentrated on Corrugated to assure prompt delivery for industrial construction. Free Engineering Service, available on request; shows how Asbestone can be adapted to your needs.

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simplification at New York University. The session marks the first time the course, open only to industrial engineers, executive supervisors, and training directors empowered to carry on work simplification training programs, has gone into a single business organization and heard its problems aired. A second NYU seminar group sat in on the discussions.

As a direct result of the round table discussions, Bigelow-Sanford will overhaul its own work simplification training program.

In the group were several executives employed by Alexander Smith & Sons Carpet Company, a leading competitor of Bigelow-Sanford.

As part of the program, moving pictures made by members of the group and slide films on work simplification were shown. An interesting feature was the demonstration by several sales representatives of materials useful to work simplification men.

IMPROVING WORKING CONDITIONS

WILLIAM B. GIVEN, JR., President, American Brake Shoe Company, speaking before the Industrial Hygiene Foundation

Industrial hygiene has up to recently been years and years behind medicine. That distance has been greatly reduced. But we in industry are still lagging.

We need not only better working conditions, but also the best possible working conditions. Today, we have a new conception of what plants ought to be. Every part of every plant must be better lighted than even the expert says is necessary. Every possible safety hazard, irrespective of cost, must be eliminated. There must be cleanliness, good air, and the best temperature possible to maintain.

There must be as little lifting and carrying as possible. There must be a decent wash and locker room, with ventilation so that men can shower and change clothes in comfort, and not have to put on damp work clothes the next day. There must be a clean place to eat. As far as is humanly and mechanically possible, our job is to give each man conditions we should like, were we working in his place. This is not only a human obligation, it is the only way we can gather into our working forces decent, competent young men—the only way we can successfully compete for them with other industries.

If you rate the best people, gradu-

Let Wagner fill this spot... for highest Machine Tool efficiency!

MACHINE tool efficiency is of vital importance in today's stepped-up production schedules. Motor failure means "time out" for the machine, interrupted schedules, and lost profit.

Wagner Quality Motors provide a *reliable* source of power to drive your machine tools —they are famous for their unfailing dependability—and they give you quiet, smooth, vibrationless performance as well!

Many far-sighted machine tool manufacturers have standardized on Wagner Motors. They *know* that dependability and continuity of operation are of paramount importance in a good machine tool . . . and they *know* that Wagner Motors can assure longer life and reduced maintenance costs. If you manufacture or use motor driven equipment, Wagner can furnish a motor that will fit your needs. Users of Wagner Motors also profit by our quick, convenient, nationwide service facilities.

Wagner maintains twenty-nine branch offices, located in principal cities. These offices are manned by trained field engineers who will be glad to help you solve your motor application problems. Write for Bulletin MU-185 for information on the complete line of Wagner Quality Motors.

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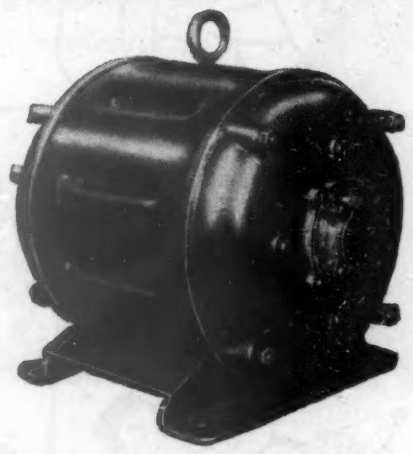

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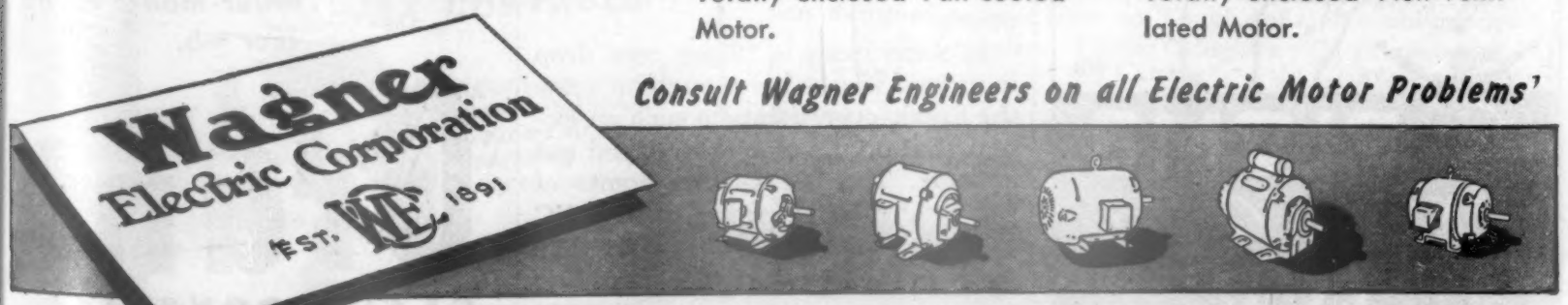

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ally you will get them. Management has always known the importance of right people. In the old days it went out and looked for them. In recent years we have realized that to get them we must earn the reputation of having a better place to work. In the future, no plant will rate the best people without a successful medical department.

If industry is to continue to improve working conditions and make medical and safety programs as effective as possible, these conditions must obtain:

1. The senior officers in companies must feel and accept personal responsibility for effectiveness in their medical departments.

2. Industry must be willing to spend generously for better working conditions. Many companies today are hamstrung by budget controls which defer until a later date expenditures for "musts" today.

3. Management must teach its operating people to practice better cooperation with their medical departments.

4. Industry must be as willing to gamble on new safety "possibles" as it is to gamble on new production ideas.

5. We must see to it that those in charge of medical departments understand the human elements involved. Once we have chosen the right kind of medical boss, he must have the effective backing of company officers. Many an able medical head is wasted in companies where company officers have the right "patter" and the wrong hearts.

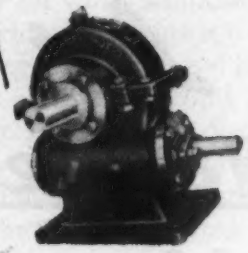
PROFITS AND THE BREAK-EVEN POINT

FRED V. GARDNER, Fred V. Gardner & Associates, speaking before the American Management Association

Management has done a poor job in presenting its profits, and in justifying its prices, mainly because it has insufficient knowledge of break-even points.

In some cases, a 10 per cent drop in prices would be enough to raise the break-even points to such an extent that profits would be wiped out entirely. The break-even points of 892 companies reporting to the SEC are on the average twice what they were in 1941, even at today's selling prices—and in most cases, the companies have to do as large a volume of

here are "slowdowns" that spell real efficiency



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Radial thrust ball bearings
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There's real long-run economy in getting speed reducers made to give top performance. So specify Grant on your next order.

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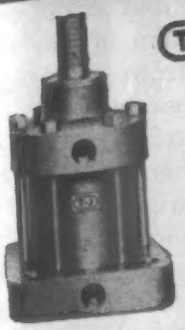

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Wide range of styles, sizes and strokes. 100 lb. to 12,000 lb. (direct) power movement.

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Automatically feed and set clinch nuts in automotive body panels, door locks, other products. Save time and labor.

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Automatically feed and set rivets. *Air powered* for aluminum alloy rivets 1/16" to 1/4" dia. incl. up to 3/4" incl. long. *Electrically powered* for solid steel rivets 1/16" to 1/4" dia. incl. up to 7/8" incl. long.

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Die sinking milling cutters for accuracy, sturdiness and more work between grinds. All standard types and sizes.

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Designed for air cylinders in semi-automatic or automatic operating cycles. Easy to install.

This year—T-J labor-saving Products will be more important than ever to plant operators who want *increased production* and *lower costs!*

Check your needs now! If your plant has tough jobs for air cylinders . . . hydraulic cylinders . . . Rivitors . . . Clinchors . . . or air controls—specify T-J! You can depend on T-J to do the job *right.* All T-J products engineered with the know-how of more than a quarter of a century . . . precision-built for utmost *accuracy* and *dependability.*

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WITH fire losses mounting and replacement costs soaring to a new high, it's time to double check your fire-fighting equipment. Is every vital location covered, and by the right type of extinguisher? Have you enough extinguishers that no point is farther than 50 feet from a dependable extinguisher? Is every extinguisher freshly charged, ready for instant action?

There is a size and type of Buffalo *better-built* Fire Extinguisher exactly suited to every class of fire hazard. There probably is a thoroughly trained Buffalo representative in your locality who will be glad to assist you in checking your fire-fighting equipment. . . . If he is not listed in your classified telephone directory, please write us direct.

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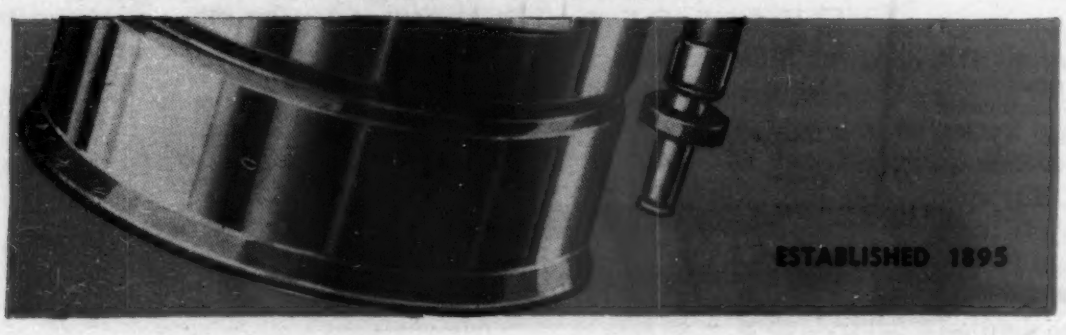


business as they did in 1935-39 to break even without any profit at all.

Standby costs and variable costs. The whole question of profits must be approached from the standpoint of break-even points, because only in that way is it possible to separate profits that are merely due to volume from those that are due to good management. Management must understand also the difference between standby costs—which are costs of time and continue regardless of volume—and variable costs, which vary with the volume.

Laws of break-even points. The laws of break-even points are listed as follows:

1. A change in standby costs affects the break-even point, but not the profit above it.

2. A change in variable cost affects both the break-even point and the marginal profit above it.

3. The effect of a change in the selling price is the same as that of a change in variable cost, but it is more marked.

4. Profit above the break-even point is affected by three things: (a) Variable cost changes; (b) selling price changes; (c) cost performance.

5. When the profit above a break-even point is low—20 per cent or less—large changes in volume are required to produce a change in profit. However, when the volume falls, costs are harder to control—but if they are controlled, losses will be smaller. When the profits above the break-even points are large—about 35 per cent—large changes in volume tremendously increase or decrease profits and have a tremendous effect on the break-even points.

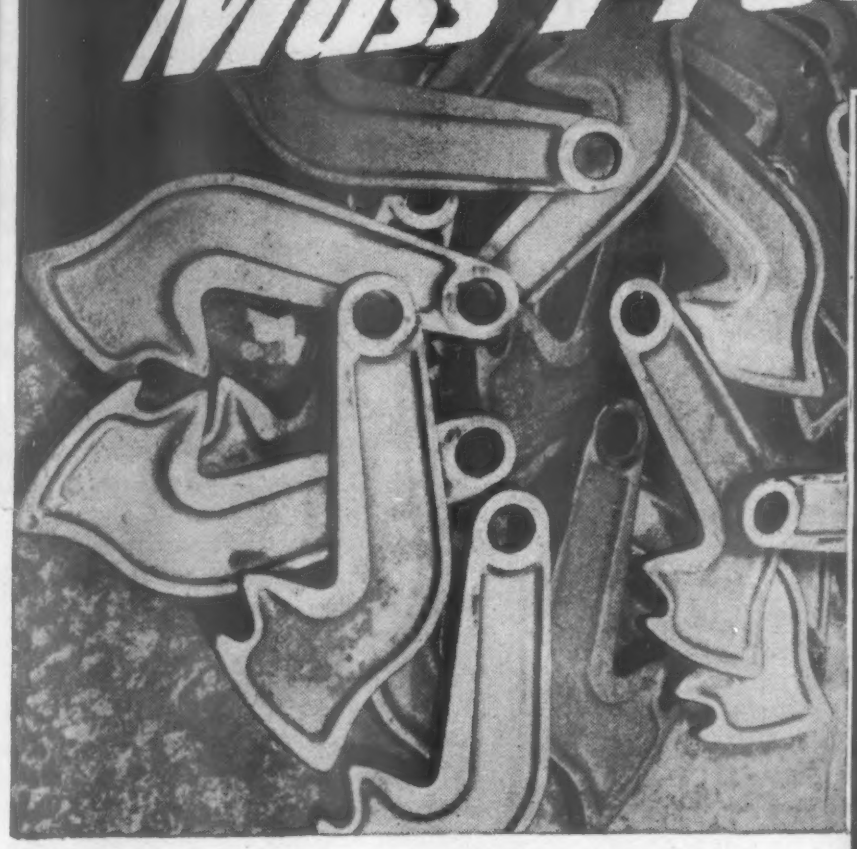
6. High profit above the break-even point does not mean good profit performance, unless standby costs are low and well controlled.

LABOR-MANAGEMENT RELATIONS BETTER IN 1947

Preliminary findings of a 1½-year study by the American Management Association, of employee participation in increasing industrial productivity, disclose that, as a direct result of effort and cooperation, labor-management relations on the whole were better in 1947 than in 1946 in the majority of 250 representative companies.

Of the 182 manufacturing com-

UNIFORMITY *in Mass Production...*



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Whether it's the first, tenth or ten thousandth steel casting, Unitcast's modern equipment coordinated by technical "know-how" results in Unitcastings consistently uniform and at the lowest possible cost. They all adhere to the strictest specifications—uniform in size, uniform in weight, uniform in physical properties.

As an example of Unitcast's consistent uniformity, the illustrated door latch for a railway specialties manufacturer has been mass produced until now the total runs well over 1,500,000!

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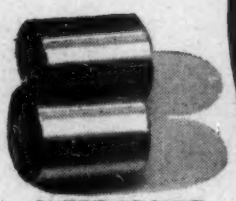

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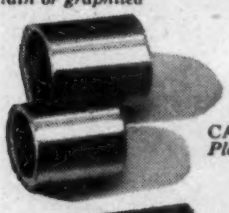
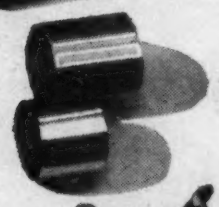
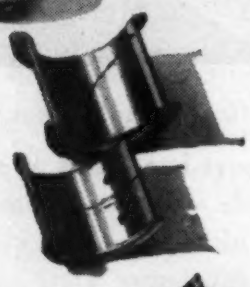


CAST BRONZE
Plain or graphited



BRONZE ON STEEL
Plain or graphited



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panies which have formal programs of employee participation, 72 per cent are "pleased" with the work of employee-management committees. Of these, 46 per cent were "moderately pleased," and 26 per cent "keenly pleased."

Forty-three per cent of the companies surveyed established a formal program of employee-management cooperation through committees because "it's good industrial relations." Twenty-three per cent did so to reduce the cost of production to improve their competitive situation, 13 per cent did so at government suggestion, and 7 per cent because of union pressure.

Approximately 85 per cent of the companies stated that at the time the programs were inaugurated they expected definite increases in productivity to result, 15 per cent undertook cooperation "just to see what would turn up."

Cooperation on a departmental basis was shown to be more widespread than on a plant-wide basis. Of the 182 companies, 144 practiced departmental cooperation; 30 per cent having practiced it for more than 10 years, and 15 per cent for less than 2 years. Only 3 per cent have abandoned the method.

In 76 of the 182 companies studied, plant-wide committees of union and management representatives were found. One-quarter of these had been established since the war, 60 per cent have existed less than 5 years, 33 per cent functioned more than 5 years, and 10 per cent for more than 10 years.

MANAGEMENT PARTICIPATION IN SAFETY

WILLIAM S. SMITH, Safety Director, Ford Motor Company, speaking before National Safety Congress

How to get active management participation in safety is easy to put on paper, but it is another thing to convert it into action. At this point I should like to give you one warning. Avoid as you would a deadly disease what I call "paper safety." Charts, reports, rules, and specifications are literally useless, unless they are vitalized into action, and, more important still, they are applied in a practical manner in the shop.

To achieve real management participation, it is vital that we cultivate the interest of the plant manager and his staff. In visiting various places outside the Ford Motor Company, I have been very surprised to hear

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New Type Arm...Faster Set-ups...Greater Accuracy

1. Accuracy to within 1/100 of an inch for the life of the machine.

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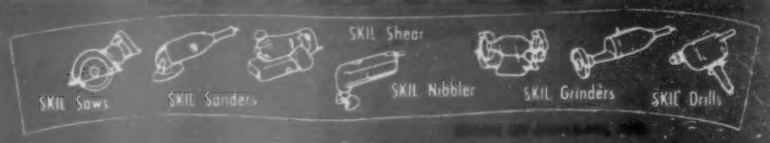
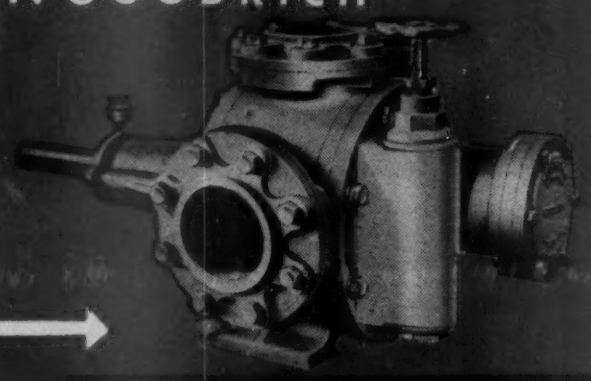
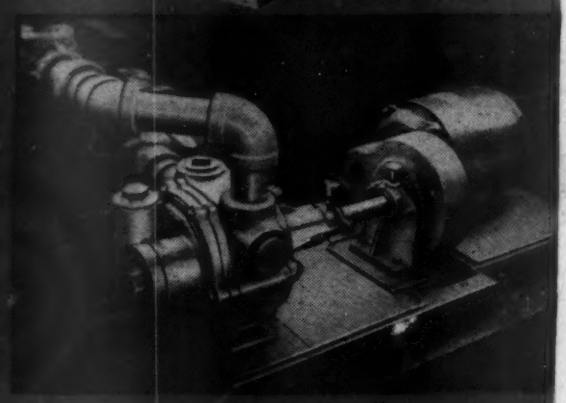


WHO? B. F. GOODRICH

WHAT? INSTALLED THIS PUMP



WHERE? AT CADILLAC, MICHIGAN PLANT



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safety engineers say, "Well, that's all right, but I don't have the authority." The question of getting authority lies squarely on the shoulders of the safety director. Experience proves conclusively that nobody is going to hand it out in the form of a present. It has to be planned, cultivated, and achieved by the safety engineer. Let me now give you a few ideas on how this can be accomplished:

1. The safety program must be practical. Production managers today are shop-trained men, and nothing appeals to them more than safety ideas that they can see working in a practical manner on the job.

2. In discussing safety engineering proposals, make it very clear that you are vitally interested in saving money as well as in preventing accidents. It is sometimes amazing how quickly a manager will participate when he sees that you have not only studied the best safety device, but that you have also looked into the cost and that you are presenting the most economical plan.

3. Show, if possible, that your proposal will increase production, will not interfere with production, or, if it does interfere, that the compensation cost as a result of a serious accident makes the installation of the safety device worth while.

4. Do everything possible to make dangerous machinery and dangerous layouts safe, instead of just flatly saying that it cannot be done. To cultivate management participation, a safety department must be progressive. It is our job to make new ideas in production safe. At the same time, have the courage to reject anything when it should be rejected.

5. Prevail upon the manager to go out and see the job, whether it be a case of an accident or a new engineering layout.

6. It is essential that you get full control, where the safety factor is concerned, in any other division where important decisions are made on safety problems. This calls for a continuous program of pointing out to each department head what can happen unless the authority of the safety department is obtained.

7. A sensible and practical accident analysis report presented in a clear, businesslike manner, creates management interest and encourages participation.

8. Use all your examples of where you are preventing accidents. Too

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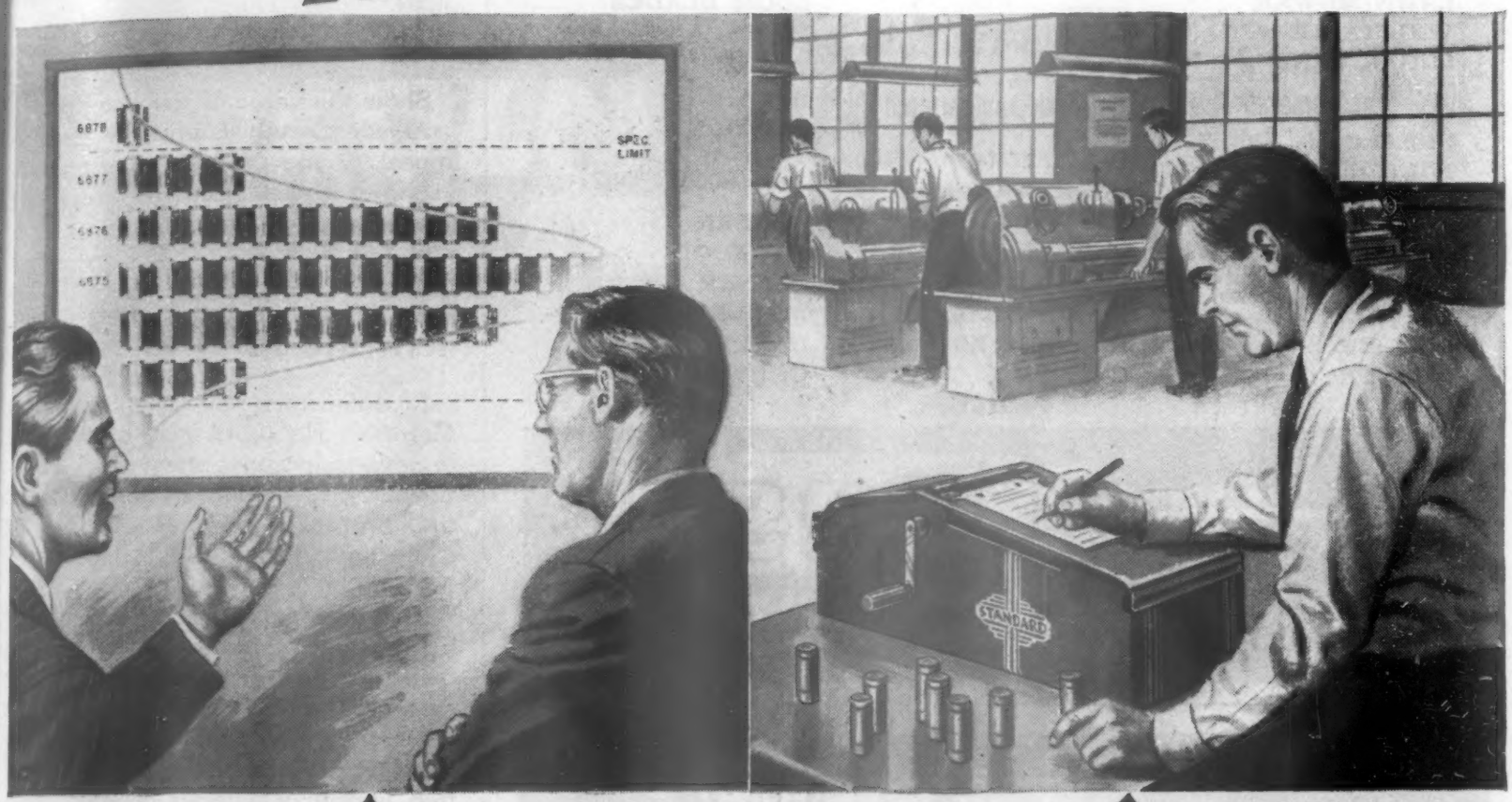

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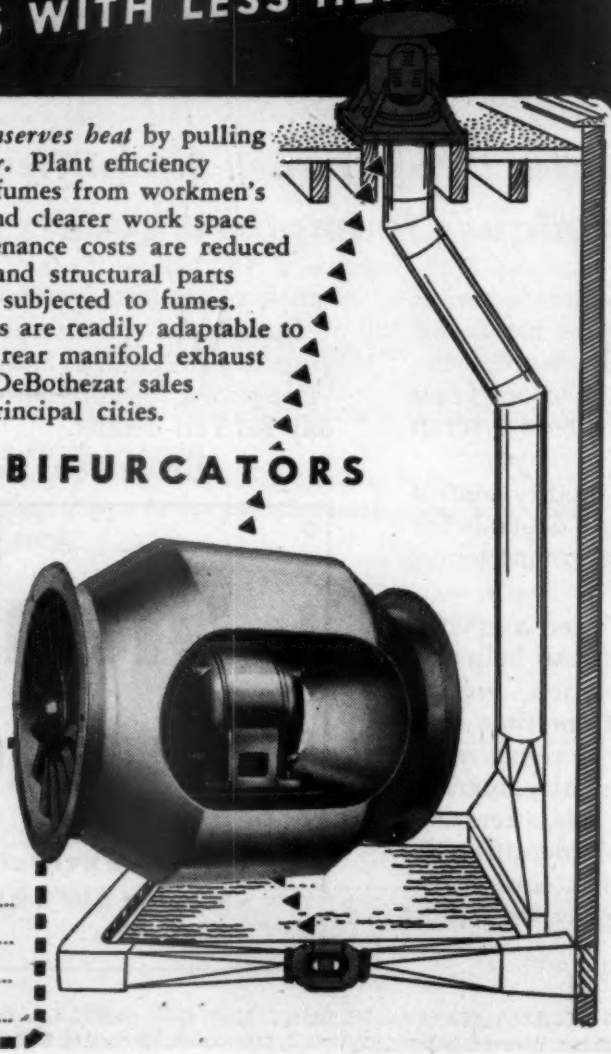

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often, all the emphasis is placed on the accidents that have happened.

Combining these eight suggestions we arrive at the importance of the following points:

Be practical.

Safety and efficiency go hand in hand.

Get into every production problem.

Be enthusiastic about new equipment.

Take the manager into the shop with you.

Show the value of strict control.

Accident analysis must be made to appeal to the production executive.

Show where accidents are being prevented

MATERIALS HANDLING INSTITUTE TO EXPAND

In 1948 fifteen more chapters of the Materials Handling Institute will be organized to supplement the educational and engineering activities of the three new chapters installed in Cleveland, Boston, and Atlanta during 1947.

The national library, educational films, and a speakers' bureau are being maintained as the methods of expanding public information about mechanical handling equipment. The membership of the national organization is now composed of companies manufacturing casters, conveyors, electric hoists, industrial trucks, floor and hand lift trucks, pallets, containers, and auxiliary equipment.

LABOR COURT IN EIRE

McGRAW-HILL WORLD NEWS, London

(Excerpt from an article in the "Manchester Guardian.")

Erie's Labor Court was set up by the Industrial Relations Act of 1946, and came into being in September of that year. Its work has fallen into two main sections—wages orders, which have statutory force, and recommendations for the settlement of disputes, which have not.

The wages orders are made under temporary powers, granted originally for a year, now extended to September, 1948. They are really a carry-over of wartime legislation. Various emergency orders were then made fixing maximum wages in certain employments. Under the Industrial Relations Act, workers are given the right to three courses of action. They can ask the court to record an existing wage order, whereupon the

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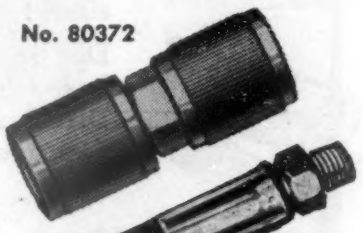

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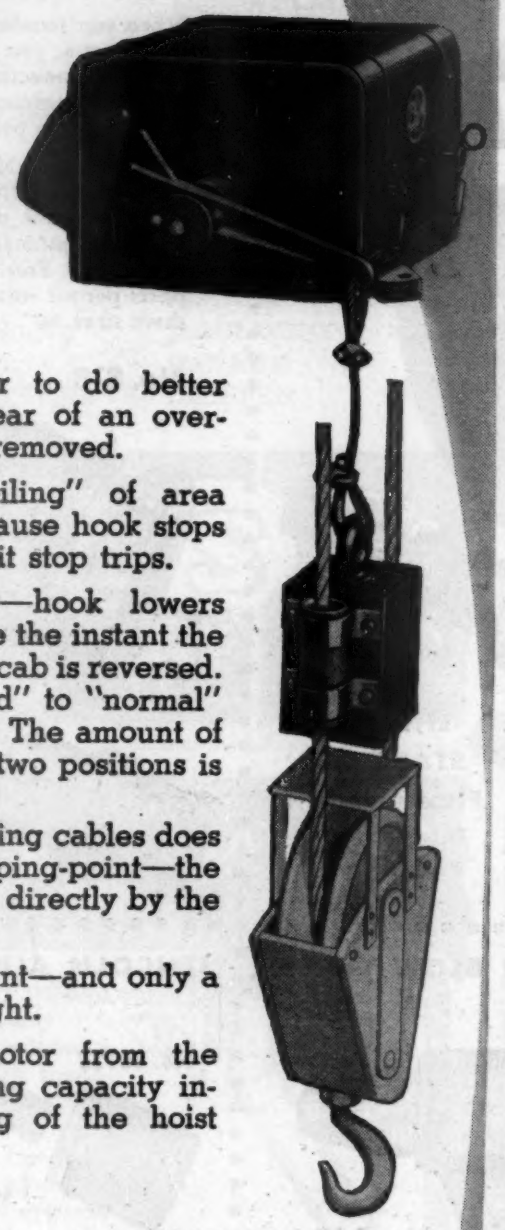

1. Enables the operator to do better work, because the fear of an over-hoisting accident is removed.
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wartime maximum is converted into a legally enforcible minimum. They can ask the court to vary an existing order, or, if no standard rate already exists, they can ask for an order on similar lines. If the court makes or varies an order, the workers have sixteen days in which to accept or reject it. Once accepted, it is legally binding.

To date, of about 1500 "standard rate or bonus" orders made under wartime powers, 280 have been so recorded. The court has received applications for 93 variation orders, and for 58 wages orders in cases where no previous order existed. It has made so far 114 orders, of which 103 have been accepted by the men concerned. The great bulk of these apply to the bakery and distributive trades, where previously wages were "in a state of chaos."

These powers are a sore point with the employers, who point out that the workers can both apply for an order and reject it when made; they themselves are entitled to be heard by the court, but can neither initiate or reject. But as this part of the court's work will come to an end next year, their grievance may die a natural death.

Number of Disputes Settled

The court can intervene in a dispute uninvited, but in fact is generally asked to come in. So far it has investigated 121 disputes, affecting about 65,000 workers. It has made 100 recommendations (with 19 cases still outstanding), which were accepted by both sides about three times out of four. (One ought, in assessing its influence, to take into account also the instances in which recommendations, although not at first accepted, became the base of a later settlement between the parties, like the sugar workers' strike in the summer, and the bus strike in the autumn.)

In general, the court has been ready to grant wage advances to offset (though not fully to equal) the rise in the cost of living and to bring up backward areas to something like the general standard. It has set itself against a reduction in working hours, and has not recommended a reduction in any case; it has, however, several times suggested limits on overtime. A frequent finding is, "The court is of the opinion that, in the present economic circumstances, a general reduction of hours would be inadvisable, and it is not considered that in this trade there is any special case for a shorter work week."

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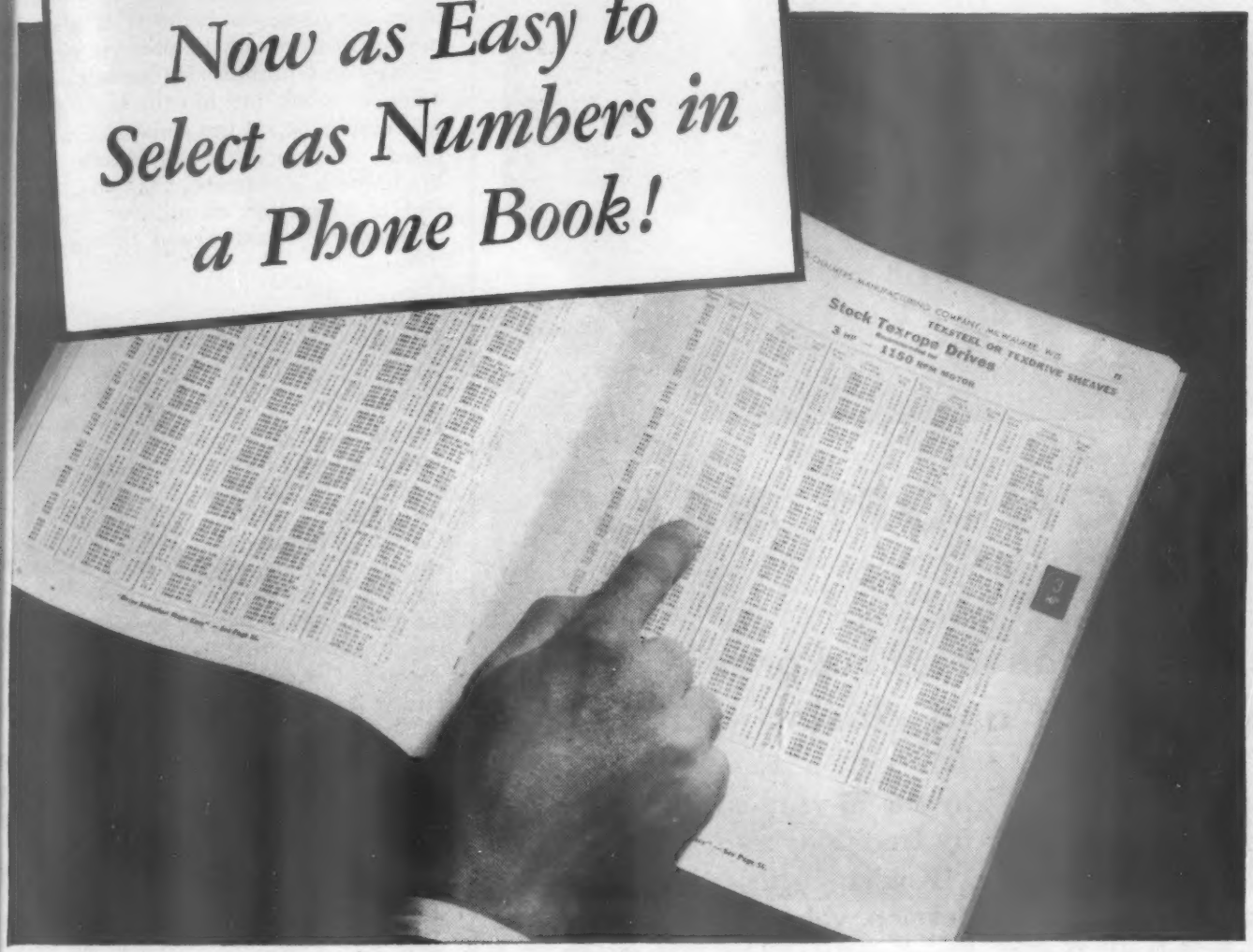

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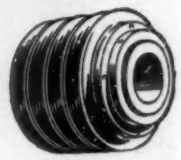

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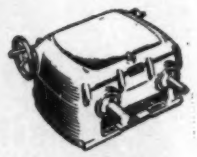

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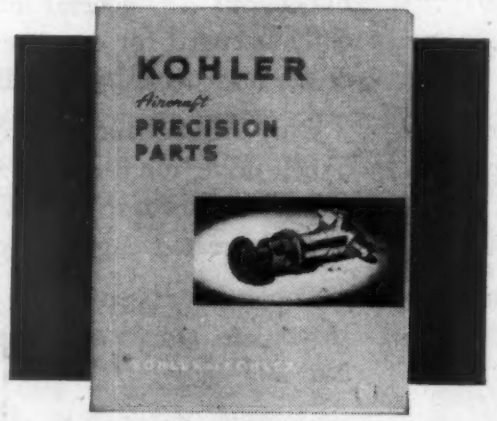

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BEHIND THE BYLINE

Facts About FACTORY'S Authors

Gilbert A. Wadsworth (page 74) has been with The Glenn L. Martin Company for almost 19 years. Originally trained as a civil engineer, he worked on several large construction projects throughout the South. Some of the projects included bridges and tunnels. He came to Baltimore to work for Martin in 1929, and was employed on the construction of all plants and facilities at Middle River. Wadsworth is married, has two children and is interested in outdoor activities particularly hunting and fishing.

Ernest V. Phillips (page 76) has been a methods engineer with Galvin Manufacturing Company, makers of Motorola radios and heaters, since 1945. During the war he was with Douglas Aircraft Company as a project engineer. His alma mater is the Illinois Institute of Technology. He is active in the Engineers' Club of Motorola and for the past five years has been financial secretary and member of the trustees and advisory board of his church.

Jack W. Taylor (page 80; see also January, page 80) worked in industrial engineering for an aircraft manufacturer during the war. He concentrated on job evaluation and enlisting labor-management cooperation in a totally new program. He is presently at work on development, coordination, and supervision of training for executives, supervisors, and line workers at Fiberglas. Taylor's hobbies and interests include flying, music (he formerly taught music), and swimming.

Robert H. Weaver (page 82) has filled the post of industrial relations director at The Falk Corporation since 1943. He served as assistant director the year previous. And for the five years prior

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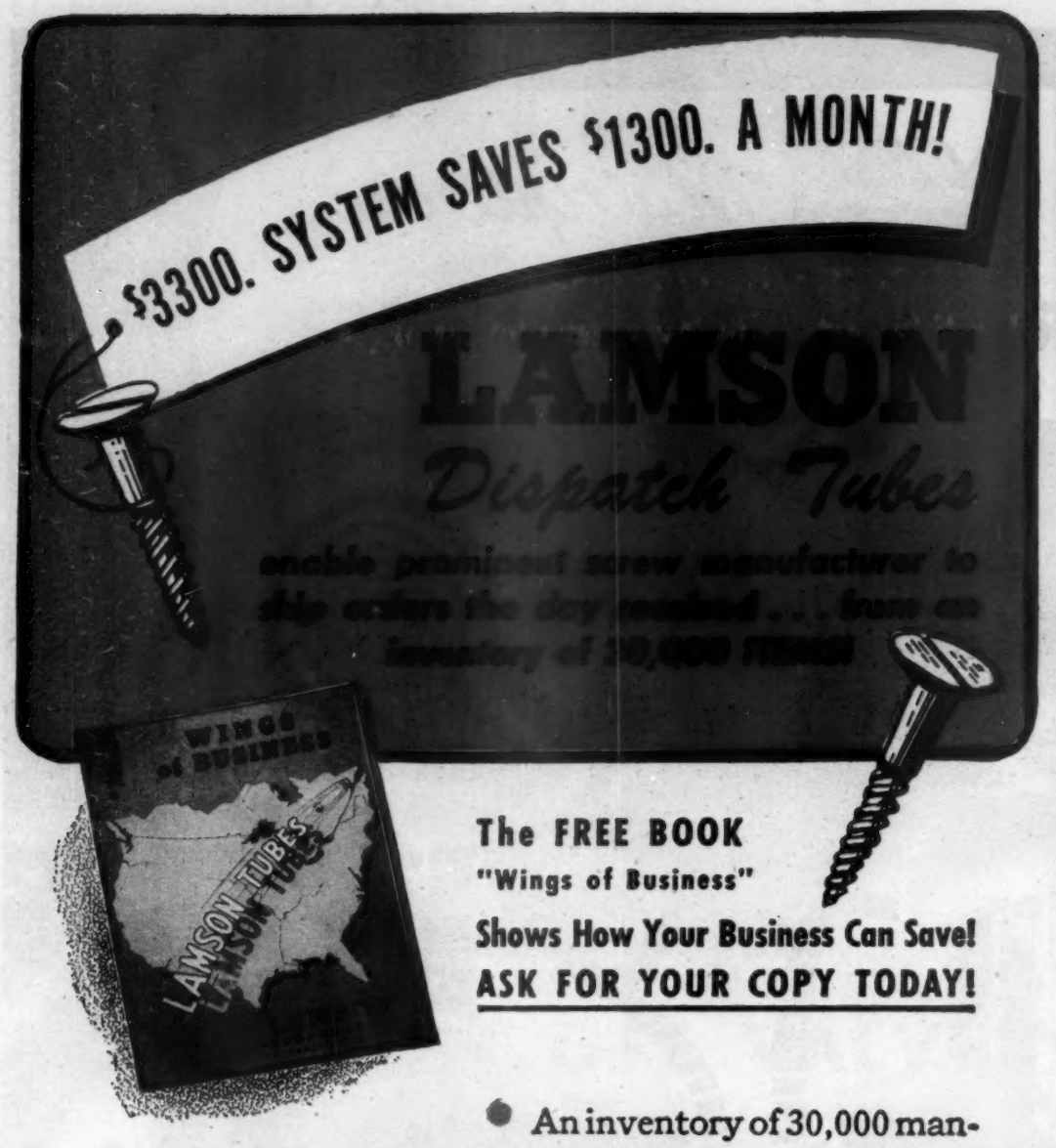

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to 1942, he was employment manager. Weaver has been active in professional groups for several years. He is a member of the Industrial Relations Association, the Industrial Club of Milwaukee, the American Foundrymen's Association, and the Industrial Recreation Association, whose national convention he guided as chairman in 1947. Several times each year he speaks on the many phases of industrial relations before various professional and civic organizations.

Kurt A. Metzger (page 86) joined the engineering staff of the Maiden Form Brassiere Company, Inc., in 1938. The following year he was elevated to the position of chief industrial engineer. His previous experience was gained in the methods and standards department of the Eagle Pencil Company, New York. In 1942 Metzger accepted a government position as production specialist with the War Production Board. A year later he became affiliated with Stevenson, Jordan & Harrison, consulting engineers. He later joined Consolidated Management Consultants in New York as supervising engineer. After serving two years in the Army, where he saw action in the ETO as an infantryman, he rejoined Maiden Form. He is a member of the Northern New Jersey Chapter of the SAM. In his spare time, Metzger is a stamp collector.

George Kepner, co-author, (page 94) started with Westinghouse Electric Corporation in 1910 in the time keeping and accounting departments. From 1926 to 1929 he was supervisor of production in the large rotating machinery aisles of the East Pittsburgh Works. From 1929 to 1930 he was assistant superintendent of production of the same Works. Until 1944 he was superintendent of production at the Steam Turbine Division in South Philadelphia. During 1942 and 1943 he served as a specialist with the power branch of the War Production Board. Kepner is also chairman of the production managers executive committee at Westinghouse, which considers company-wide problems and new production techniques.

CONTINUED ON PAGE 254

For Office Furniture
IT'S THE
"NEW LOOK"
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PRODUCTION-WISE: Output multiplies when automatically straight driving American Phillips Screws "sing a song" of *steady accelerated* production. Safe to use . . . fumble-proof, slip-proof and damage-proof, they rate high with management and workers, alike. And American Phillips Screws pay off wherever they attack inflated assembly costs, TIME SAVINGS UP TO 50% ARE COMMONPLACE!

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ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

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BEHIND THE BYLINE *(continued)*

W. T. Press, co-author, (page 94) was born in Bristol, England. He received his early training with the Rolls Royce Automobile Company and came to the United States with that company in 1919. He joined the small motor division of Westinghouse Electric Corporation in 1921. Press has served as a machine operator, set-up man, assistant foreman, methods engineer, supervisor of methods department, superintendent of manufacturing, and superintendent of stores, receiving, and shipping departments.

Harold B. Maynard, co-author (page 97), is founder and president of the Methods Engineering Council, Pittsburgh. He spent the first six years after graduation from Cornell University with the Westinghouse Electric Corporation. In 1934 he organized the Council. Author of many widely used technical books and training courses, Maynard served as national president of SAM for 1946-1947. He was the Society's delegate to the International Management Congress in Stockholm in 1947. He is also active in AMA, National Management Council, ASME, and Association of Consulting Management Engineers. In 1946 Maynard received the Gilbreth Medal from SAM for his contributions to industrial engineering.

G. J. Stegemerten, co-author (page 97), is general manager of the Methods Engineering Council. He is in immediate charge of much of the consultation work done by the Council and has supervised the installation of scientific management techniques in virtually every type of industry. Before joining the Council he was chief wage incentive consultant for Westinghouse Electric Corporation. During World War II he served as consultant for the Office of the Secretary of War. Stegemerten is author of numerous papers on work measurement and wage incentives. He is co-author of the books,

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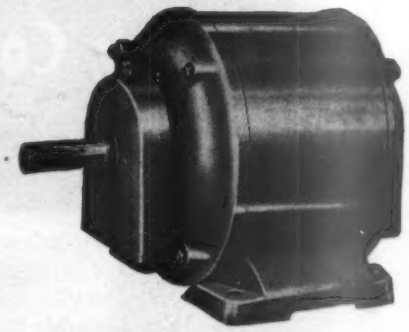

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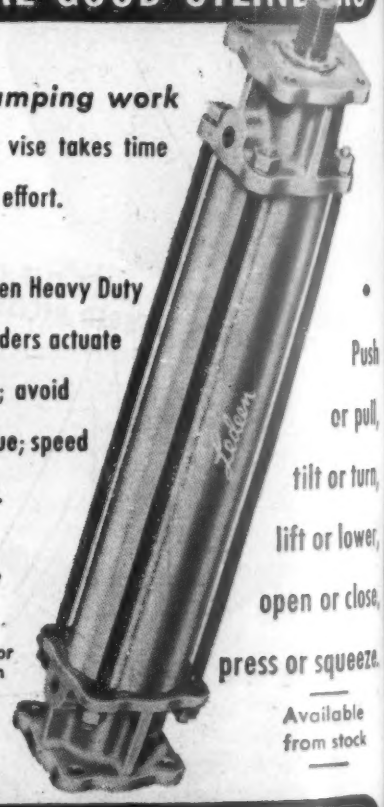

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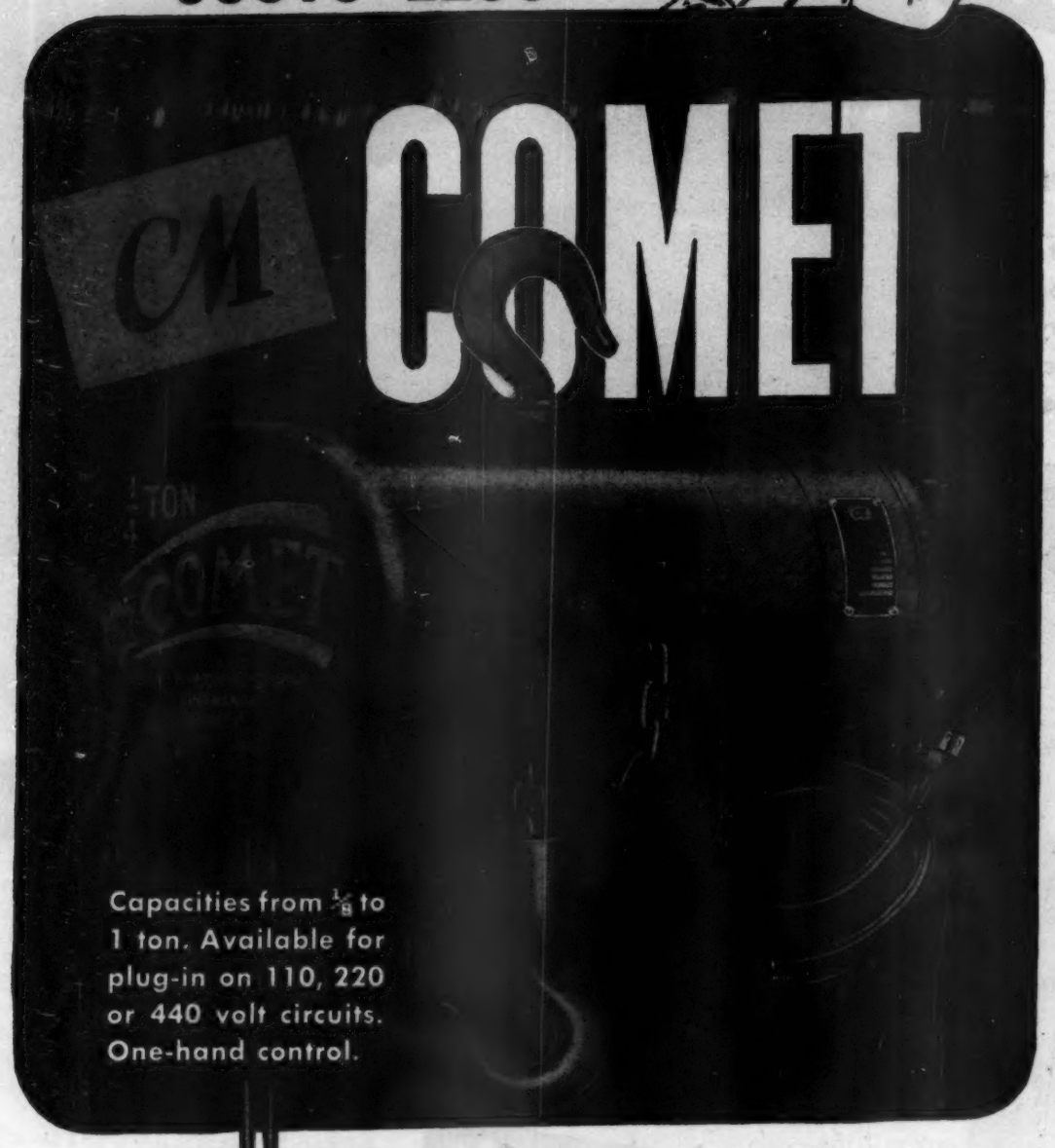

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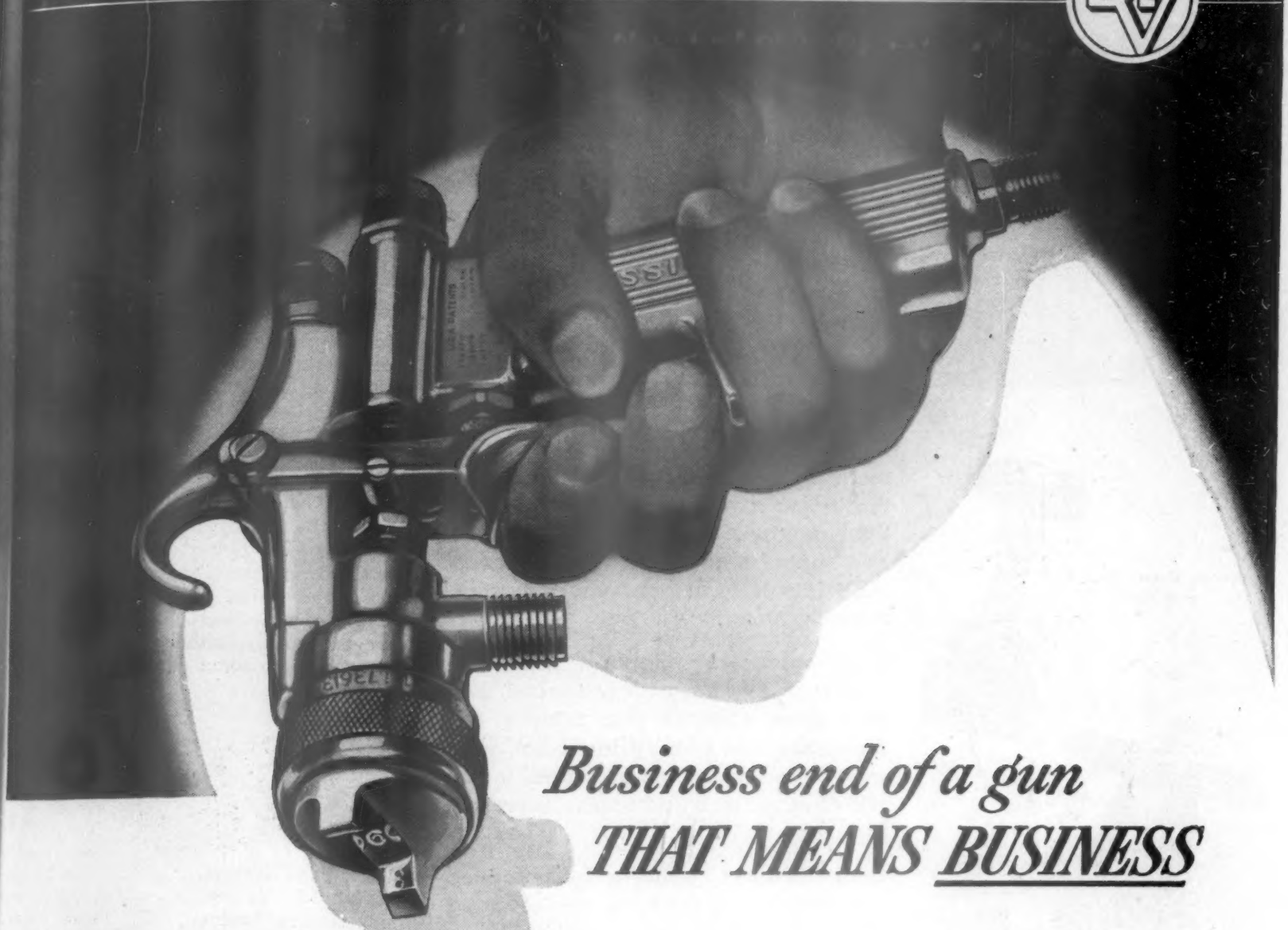
John L. Schw co-author (p 97), is mana New England vision of Met EngineeringCo cil. He has ser as a consultant for the garment, m working, and chemical industries, pu utilities, and social services. Be joining the Council, Schwab was c industrial engineer for Bryant Ele Company, industrial methods engi at Westinghouse Electric Corpora and chief ordnance inspector for Rob shaw Thermostat Company. He is president of the Bridgeport chapter SAM and Industrial Methods Soci He was general chairman of the annual conference of SAM. Schwab educated at Pennsylvania State Col and the University of Pittsburgh.

E. E. Turkin (page 105) graduated Massachusetts stitute of T nology in 19 an electrical e neer. For the next three years he connected with the firm of J. G. W & Company in various capacities, l assistant general superintendent in tric plants at Pottsville, Pa., and P land, Maine. Since joining the inspe department of the Associated Fac Mutual Fire Insurance Companie 1910, his work has covered a wide relating to the safeguarding of electrical power, light, and pro equipment in plants, as well as the justment of large electrical losses 1941 he became chief electrical engi in charge of the electrical divi

W. P. Ka (page 107) served Cen Electric Com for over 30 At present chief draft He has worked, also, in the ass testing and inspection departme

SERVING YOU by doing things with air



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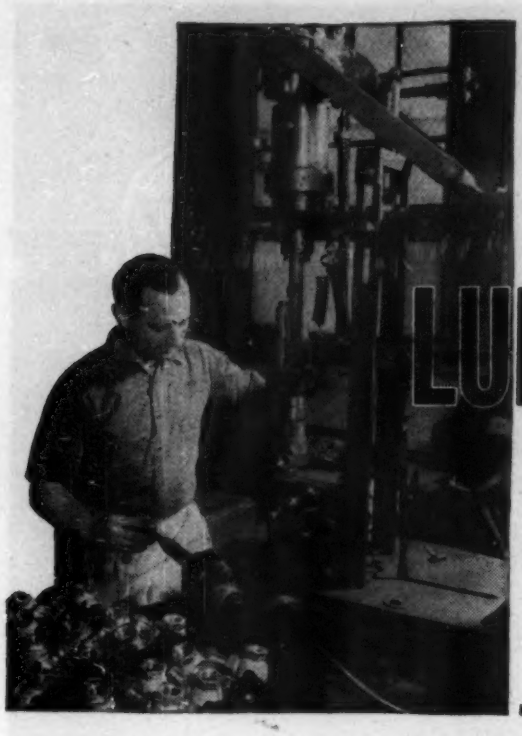

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• Assembling is greatly simplified by Lunkenheimer precision production . . . parts are so accurately made that special fitting isn't necessary.

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Precision Workmanship

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...LONGER SERVICE LIFE

Bronze Union Bonnet Gate Valve

Fig. 1430 Iron Body. Gate

• You can't fool the maintenance men on valve quality. They know that when a valve has a much longer than average service life, that valve has superior accuracy and precision built into it from handwheel to pipe threads.

Such valves are the only kind that Lunkenheimer has ever produced. For over three quarters of a century, the Lunkenheimer quality ideal has won ever widening acceptance until today it is a recognized tradition in American industry.

Lunkenheimer quality is the balanced combination of many factors. Among them are finest raw materials approved by constant testing and research . . . sound, advanced design . . . highly skilled workmanship . . . absolute accuracy . . . perfect alignment of all parts.

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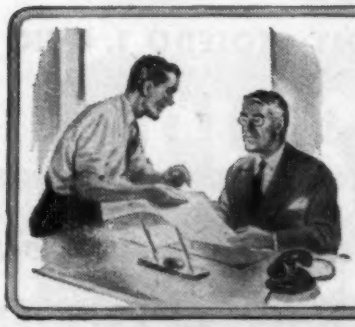

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the company. In addition, he is chairman of the company's executive Training Forum. Keiser is a veteran of World War I, having served in the Tank Corps of the AEF.

Benjamin Cooper (page 113) joined General Electric Company in 1937 following his graduation from Swarthmore College. After working as a test engineer for two years, he was transferred to the engineering general division for completion of a company program which included several short assignments in various engineering divisions. In 1941 he entered the control engineering division and since that time has been associated with electronic control equipment. His work with electronic motor controls has ranged from fractional-horsepower motors to large multiple coordinated drives. His principle hobbies are gardening and golf, not practiced simultaneously, although he does occasionally do some digging with a golf club, too.

Carl O. Nelson (page 118) gained his factory background while in the health department of the City of Milwaukee during the depression. After that long spell, he joined Tri-Clover to organize the personnel department. He believes that association with business groups is most worth while, and therefore takes an active interest in the Industrial Relations Association of Wisconsin, National Association of Personnel Directors, and the Kenosha Manufacturers Association. Nelson is on the "call staff" of the University of Wisconsin, where he graduated with a B.A. degree in, "of all things—philosophy."

Ira J. Barber (page 120) was born in Scranton, Pa., in 1905. In 1926 he was graduated as an electrical engineer from Pennsylvania State College. Until 1929 he worked at the Atlantic City Electric Company. Between 1929 and 1943 he worked for the Ohio Power Company in four cities, where he specialized in industrial heating. Since 1943, Barber has been employed at Fostoria Pressed Steel Corporation as director of training.

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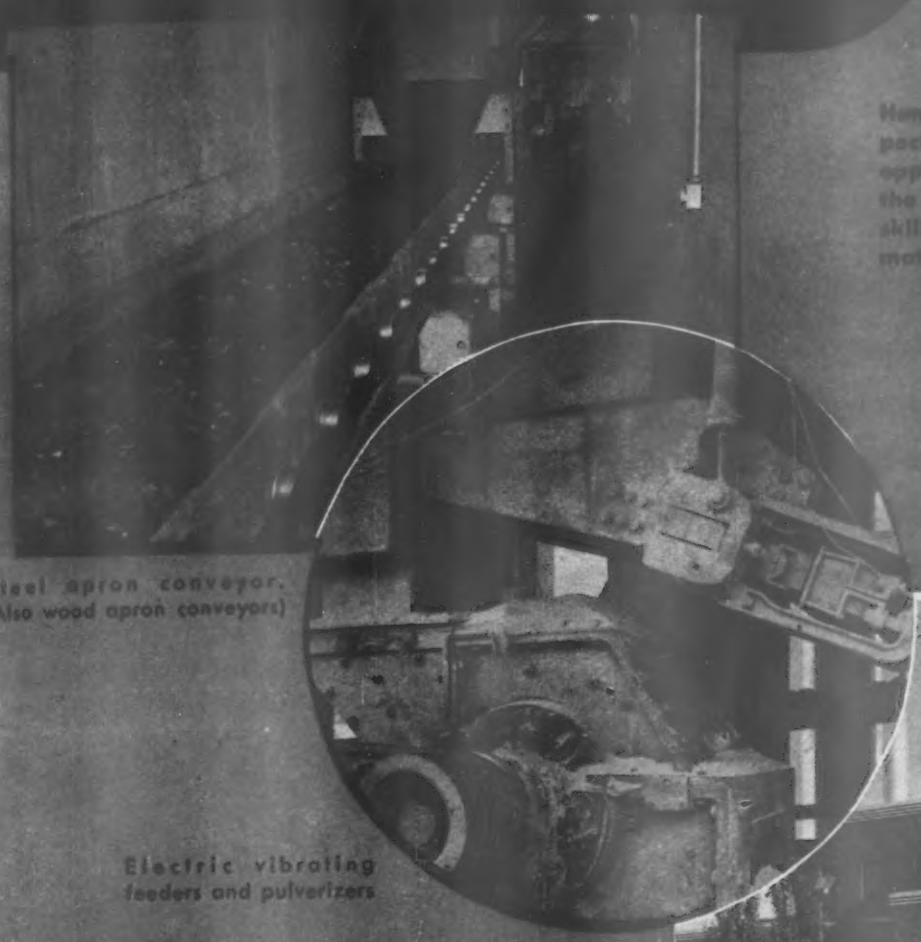
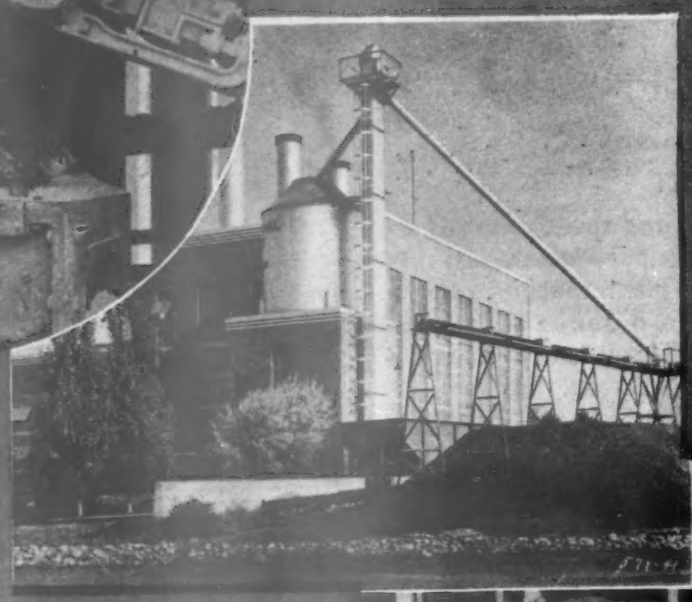


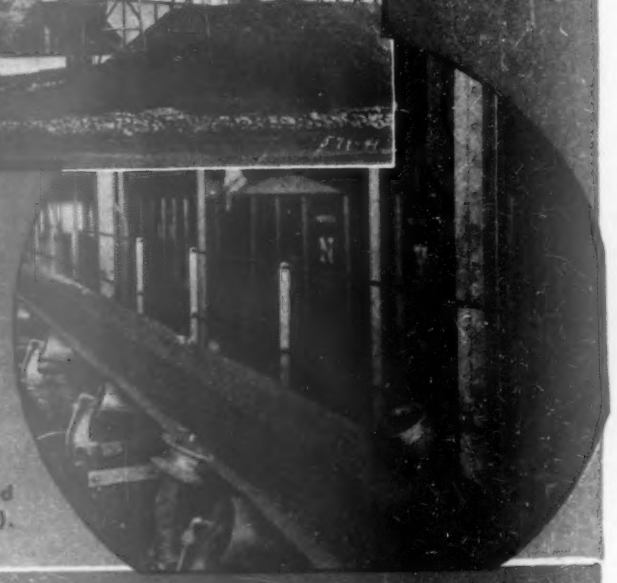
Steel apron conveyor. (Also wood apron conveyors)

Electric vibrating feeders and pulverizers

FOR HANDLING LARGE QUANTITIES OF BULK MATERIAL. A CONSTANT, UNINTERRUPTED FLOW



Coal and ashes handling — bucket elevators, conveyors, weigh larries, skip hoists, crushers, car pullers, etc.



Belt conveyors (troughed or flat belt types).

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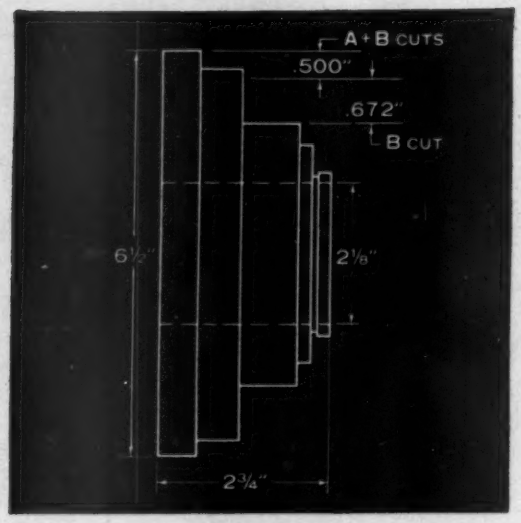

for instance . . .

Note the power and speed required to turn the two principal diameters of this SAE-1020 steel part, machined with carbide tools on a Jones & Lamson No. 5 Ram Type Turret Lathe. Two cuts taken simultaneously on the A and B diameters at 305 SFM WITH .015" FEED, require 15 HORSEPOWER. The second cut on the B diameter at 257 SFM and .015" FEED, requires 18 HORSEPOWER. This piece is machined from cut off stock to the dimensions shown, in 7 MINUTES, floor to floor—twice as fast as with high speed steel cutting tools.

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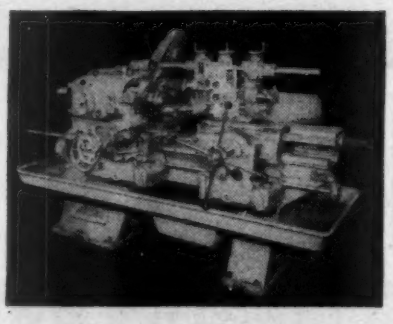

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ARE POWERED FOR CARBIDE

BOOKS

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NORMAN S. BUCHANAN, Professor of Economics, University of California, and **FRIEDRICH A. LUTZ,** Professor of Economics, Princeton, with the Report and Recommendations of the Committee on Foreign Economic Relations. The Twentieth Century Fund, 330 West 42nd St., New York 18. 434 pages. Tables, charts, appendixes 1, 2, and 3, bibliography, index. $3.50.

Subtitled "America's Role in Foreign Trade and Investment," this book surveys previous experience in world trade and foreign investment, and reports on the situation at present. The organization of new agencies, such as the International Bank for Reconstruction and Development and the International Monetary Fund, is discussed, as well as the hazards of foreign investment under present world conditions, the need for multi-lateral trade, and the obstacles in its path.

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EUGENE W. F. FELLER. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 426 pages. Photographs, sketches, diagrams, figures, graphs, appendix, index. $6.

Information needed for the solution of specific metering and control problems is presented here. Basic principles of control are explained, and construction and operation of liquid-level, pressure, temperature, speed, and humidity indicators and controllers are described.

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ABRAHAM COHEN. Macdonald & Evans, 8 John St., Bedford Row, London W. C. 1. 112 pages. Graphs, tables. 10s.

Subtitled "A critical study of some conceptions and methods with suggestions for improvement." Some of the chapter headings are: Time-Standard Settings; Fatigue; Why Do Poor Methods Lead to Good Results?; How to Set a Time Standard; Training People to Learn Rating; Standard Data; Index of Books, Magazines, etc., to Which Reference Is Made.

FULL EMPLOYMENT IN YOUR COMMUNITY

A Report of the W. E. Upjohn Institute for Community Research. Public Administration Service, 1313 East 60th St., Chicago 37. 119 pages. Tables, charts, references. $2.75.

This book is an effort to bring together all the major suggestions aiming toward achievement and maintenance of full employment, as far as these proposals relate to local action. The emphasis on the local level does not imply that many of these problems could not be solved at

DUST GAUGES MANY LOSSES

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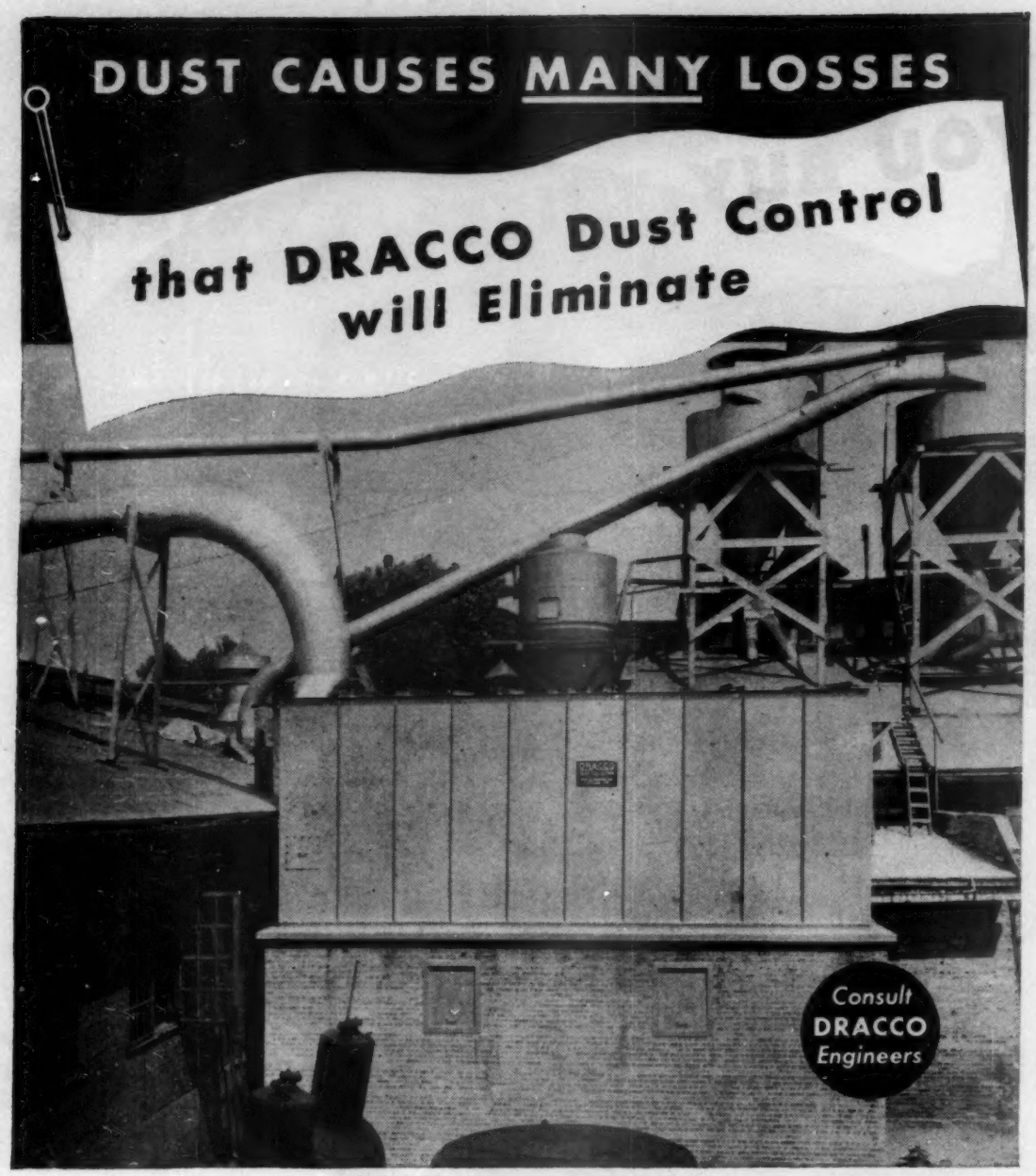

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national or even international levels. However, the report brings out the fact that communities vary markedly in the extent to which they withstand the alternations of boom and depression, and those that attempt to steer a well-planned course are more likely to weather the storms of future variations than those failing to take such action.

AUDIOVISUAL AIDS TO INSTRUCTION

WILLIAM EXTON, Jr., Captain USNR, Inactive. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 344 pages. Photographs, charts, posters, tables, index. $4.

The audiovisual techniques developed by the Armed Forces emergency training program during the war are reported here by the author, who includes articles by fourteen experts in the particularly specialized fields under discussion. The application of these techniques to civilian education and to industrial training is considered in detail, as are the various types of projected, graphic, recorded, and three-dimensional aids.

WORK ROUTING, SCHEDULING, AND DISPATCHING IN PRODUCTION

JOHN YOUNGER and **JOSEPH GESCHELIN.** The Ronald Press Co., 15 East 26th St., New York 10. 3rd edition. 168 pages. Photographs, charts, figures, graphs, problems, index. $3.50.

This book was written to aid production men in their task of assembling and organizing data on materials, machinery, and manpower needed to get each job under way smoothly, carried through the proper channels of operation, closed out on schedule. It shows how it is possible to follow through immediately with no time lost in getting the next job started. The regularly paced, yet flexible, plan of routing, scheduling, and dispatching, essential to such successful production, is discussed at length.

BEST'S 1948 SAFETY DIRECTORY

Alfred M. Best Co., Inc., 75 Fulton St., New York 7. 494 pages. Photographs, sketches, geographical and product indexes. $5.

Second annual edition. Listing of safety, first aid, hygienic, and fire protective products, with descriptions and uses, names of manufacturers and distributors. Contents separated into the following categories: Fire Protection, Personal Protection, Personal Hygiene and Sanitation, Plant Maintenance and Sanitation, Above-Ground Protection, Liquid and Solid Materials Handling, Atmosphere Control, Machinery Guarding and Control, and Training and Warning Aids.

SELECTED TECHNIQUES OF STATISTICAL ANALYSIS

Statistical Research Group, Columbia University. Edited by **CHURCHILL EISENHART,** National Bureau of Standards, **MILLARD W. HASTAY,** National Bureau of Economic Research, and W.

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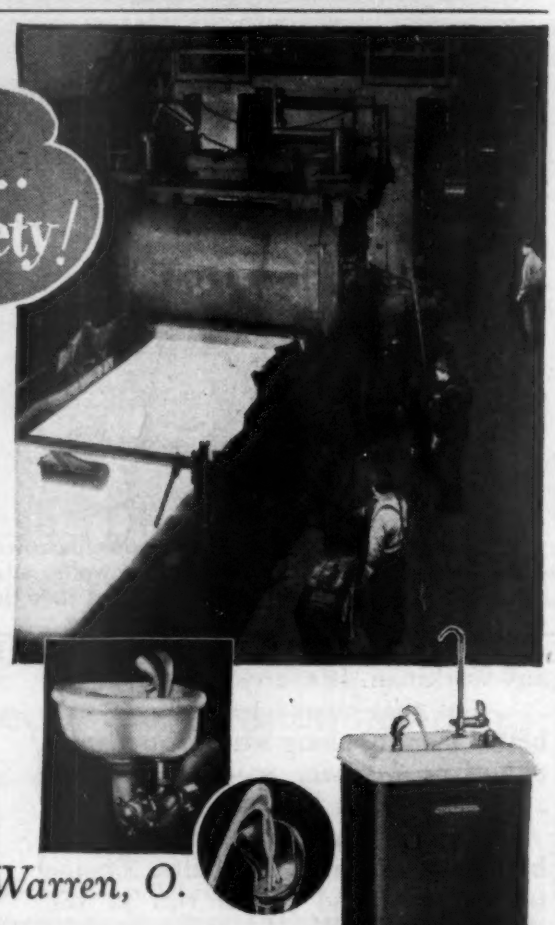

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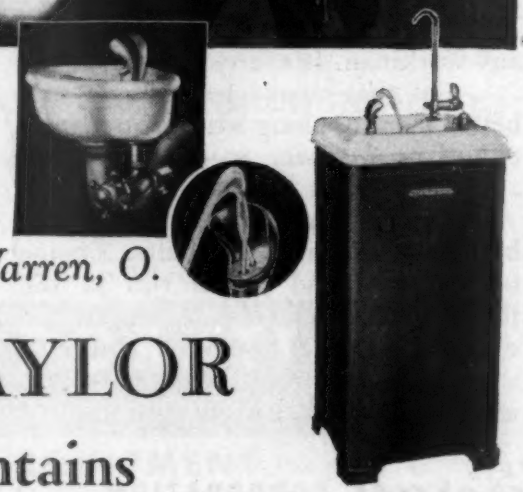

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ALLEN WALLIS, University of Chicago. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 473 pages. Charts, graphs, tables, index. $4

Subtitled "For Scientific and Industrial Research and Production and Management Engineering." A discussion of problems that occur frequently in planning, analyzing, or interpreting quantitative data. The various techniques appropriate to these problems are explained, and the statistical approach to a problem, together with the theory that can be brought to bear upon it, is considered. Computational procedures are reported in detail.

BOOKLETS

INDUSTRIAL RELATIONS UNDER THE TAFT-HARTLEY LAW. Personnel Series No. 112. American Management Association, 330 West 42nd St., New York 18. 62 pages. Graph. $1.25.

INFLUENCING AND MEASURING EMPLOYEE ATTITUDES. Personnel Series No. 113. American Management Association, 330 West 42nd St., New York 18. 56 pages. Sketches. $1.

PLANT-WIDE AND GEOGRAPHICAL SALARY ADMINISTRATION. Personnel Series No. 114. American Management Association, 330 West 42nd St., New York 18. 42 pages. Tables, graphs. 75c.

DICTIONARY OF LABOR ECONOMICS. Byrne Horton, Ph. D. Public Affairs Press, 2153 Florida Ave., Washington 8, D. C. 32 pages. $1.

STANDARD WELDING SYMBOLS. American Welding Society, 33 West 39th St., New York 18. 71 pages. Sketches, diagrams. 50c.

SUMMARY OF PROCEEDINGS OF CONFERENCE ON PRODUCTIVITY, October 28-29, 1946. Bulletin No. 913. United States Department of Labor, Bureau of Labor Statistics, Washington 25, D. C. 52 pages. 15c.

FUNCTIONS OF THE CONTROLLER. Policyholders Service Bureau, Group Insurance Division, Metropolitan Life Insurance Co., 1 Madison Ave., New York City. 52 pages. Charts. No charge to executives requesting copies on business letterhead.

NFI WAGE RATE AND CONTRACT PROVISIONS—REPORT "C". National Foremen's Institute, Inc., 500 Fifth Ave., New York. 81 pages. Charts, graphs. Industry index. Analysis of contract provisions by states. $2.50.

CAPITAL GOODS INDUSTRIES AND TAX REFORM. Machinery & Allied Products Institute, 120 South La Salle St., Chicago 3. 39 pages. Single copies, 25c, lower prices for quantity orders.

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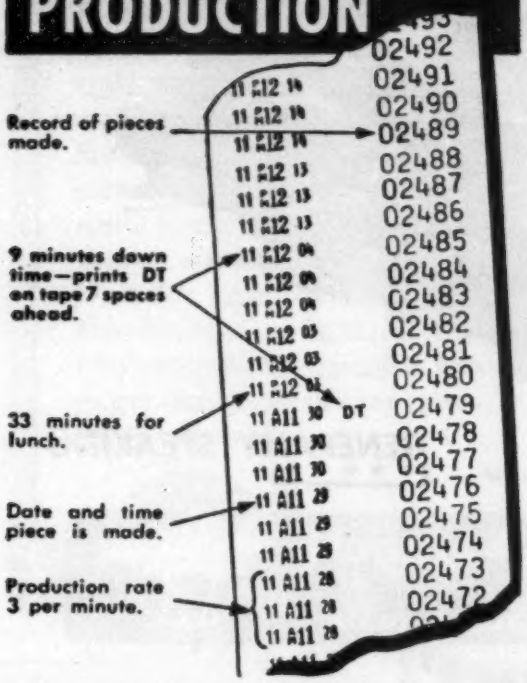

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ON THE CALENDAR

FEBRUARY

15-19, American Institute of Mining Engineers, Annual Meeting, Hotel Pennsylvania, New York. H. N. Appleton, Convention Manager, 29 West 39th St., New York.

16-18, American Management Association, Personnel Conference, Palmer House, Chicago. James O. Rice, Manager, 330 West 42nd St., New York 18.

MARCH

1-5, American Society for Testing Materials, Spring Meeting, Hotel Statler, Washington, D. C. Robert J. Painter, Assistant Secretary, 1916 Race St., Philadelphia 3.

1-6, American Society of Mechanical Engineers, Spring Meeting, St. Charles Hotel, New Orleans. Ernest Hartford, Executive Assistant Secretary, 29 West 39th St., New York.

4-5, The Society for the Advancement of Management, Inc., Spring Conference on Management, Planning and Controls, Sheraton Hotel, Chicago. Carl S. Coler, Executive Director, 84 William St., New York 7.

14-19, National Electrical Manufacturers Association, Spring Meeting, Edgewater Beach Hotel, Chicago. R. J. Blais, Convention Manager, 155 East 44th St., New York.

15-19, American Society of Tool Engineers, 16th Annual Meeting, in conjunction with the Tool Engineers Industrial Exposition, Public Auditorium, Cleveland. Harry E. Conrad, Executive Secretary, 1666 Penobscot Bldg., Detroit 26.

22-24, Chicago Technical Societies Council, Inc., Production Show and Technical Conference, Stevens Hotel, Chicago. Lewis M. Glassner, Public Relations Counsel, 53 West Jackson Blvd., Chicago 4.

APRIL

5-8, National Association of Corrosion Engineers, Annual Conference and Exhibition, Jefferson Hotel, St. Louis. A. B. Campbell, Executive Secretary, 905 Southern Standard Bldg., Houston 2, Tex.

5-8, Southern Machinery and Metals Exposition Inc., Third Exposition, Atlanta Municipal Auditorium, Atlanta. Michael F. Wiedl, Managing Director, 267 East Paces Ferry Rd., N. E., Atlanta 5.

7-9, Midwest Power Conference, Sheraton Hotel, Chicago. Stanton E. Winston, Conference Director, Illinois In-

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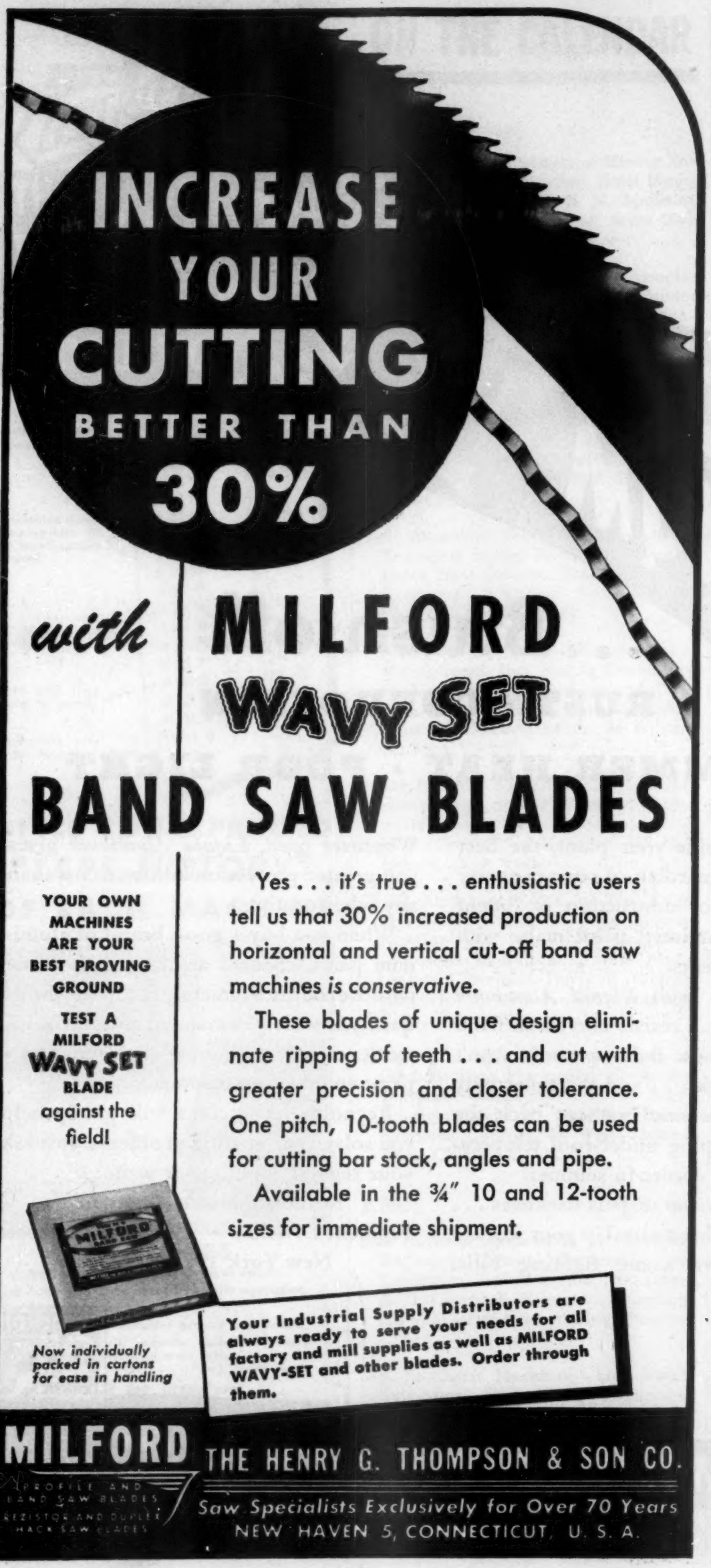
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stitute of Technology, 3300 Federal St., Chicago 16.

8-9, The Society for the Advancement of Management, Inc., Time Study and Methods Conference, Pennsylvania Hotel, N. Y. Carl S. Coler, Executive Director, 84 William St., New York 7.

12-14, National Association of Personnel Directors, 3rd International Personnel Conference, Hotel Statten, Buffalo. M. E. Jensen, Secretary-Treasurer, 1 North LaSalle St., Chicago 2.

13-15, Safety Engineers, Annual Safety Conference and Exposition, Hotel Pennsylvania, New York. Paul F. Stricker, Executive Vice-President, Greater New York Safety Council, Inc., 60 East 42nd St., New York 17.

19-21, American Society of Lubrication Engineers, National Convention and Lubrication Exhibit, Statler Hotel, Buffalo. W. F. Leonard, Secretary-Treasurer, 343 South Dearborn St., Chicago 4.

19-23, American Chemical Society, Spring Meeting, Stevens Hotel, Chicago. Alden H. Emery, Secretary, 1155 Sixteenth St., N.W., Washington, D. C.

22-23, American Leather Belting Association, Spring Meeting, Hotel Claridge, Atlantic City. E. R. Rath, Executive Vice-President, 41 Park Row, New York.

26-29, Chamber of Commerce of the United States, Annual Meeting, National Chamber Bldg., Washington, D. C. Ralph Bradford, General Manager, 1615 H St., N.W., Washington 6, D. C.

MAY

3-7, American Foundrymen's Association, Inc., Convention and Foundry Show, Philadelphia Convention Hall, and Commercial Museum, Philadelphia. Wm. W. Maloney, Secretary-Treasurer, 222 West Adams St., Chicago 6.

10-13, National Fire Protection Association, 52nd Annual Meeting, Hotel Statler, Washington, D. C. Percy Bugbee, General Manager, 60 Batterymarch St., Boston 10.

13-14, American Management Association, Production Conference, Hotel Statler, Detroit. James O. Rice, Manager, 330 West 42nd St., New York 18.

20-21, Society of the Plastics Industry, Annual Meeting, Ambassador Hotel, Atlantic City. Ronald Kinnear, Committee Chairman, 295 Madison Ave., New York.

24-27, American Public Relations Association, 1st International Public Relations Institute, in conjunction with 3rd Annual Convention, American University, Washington, D. C. Charles T. Dockarty, Executive Director, 1427 Eye St., N.W., Washington, D. C.

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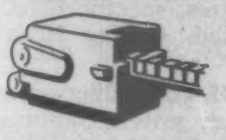

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5

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6

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7

BRUSH HOLDERS AND TANK—Illustrated circular depicts Snap-On brush holders for holding brushes suspended in cans, and a brush tank for holding brushes. Lists features and prices. E. & J. Enterprises.

8

BULK CONVEYORS—Book 2175, 48 pages, contains engineering data, charts, tables, and formulas covering size, operating speed, and capacities of Bulk-Flo conveyors. Cutaway views show conveying medium and direction of travel. Photographs show installations conveying different types of materials. Link-Belt Co.

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CHAIN BLOCK JACK—called Hoist-Jack, is the subject of 4-page Bulletin HJ-1. Applications are pictorially presented, and features, specifications, and price are included. Coffing Hoist Co.

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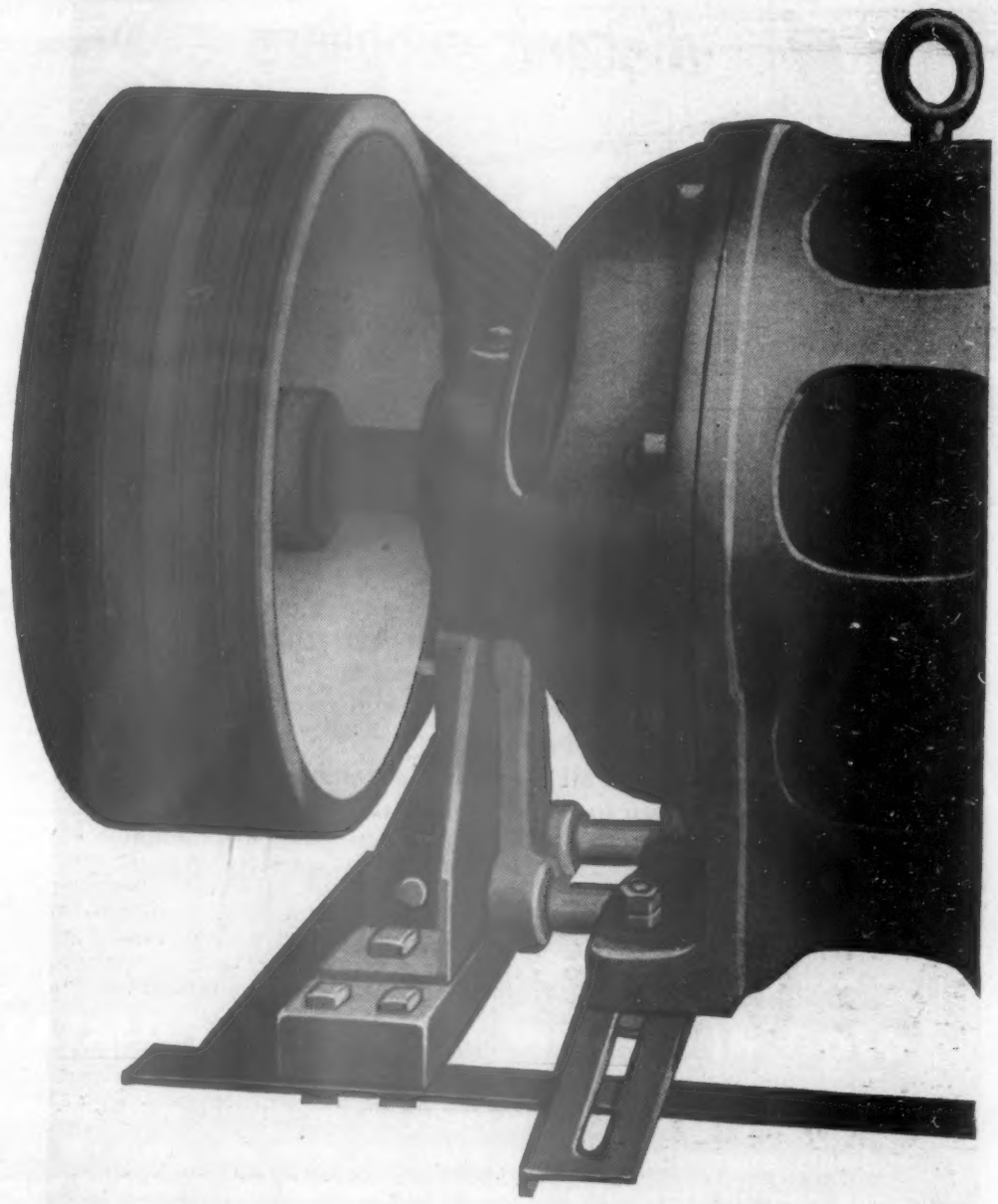

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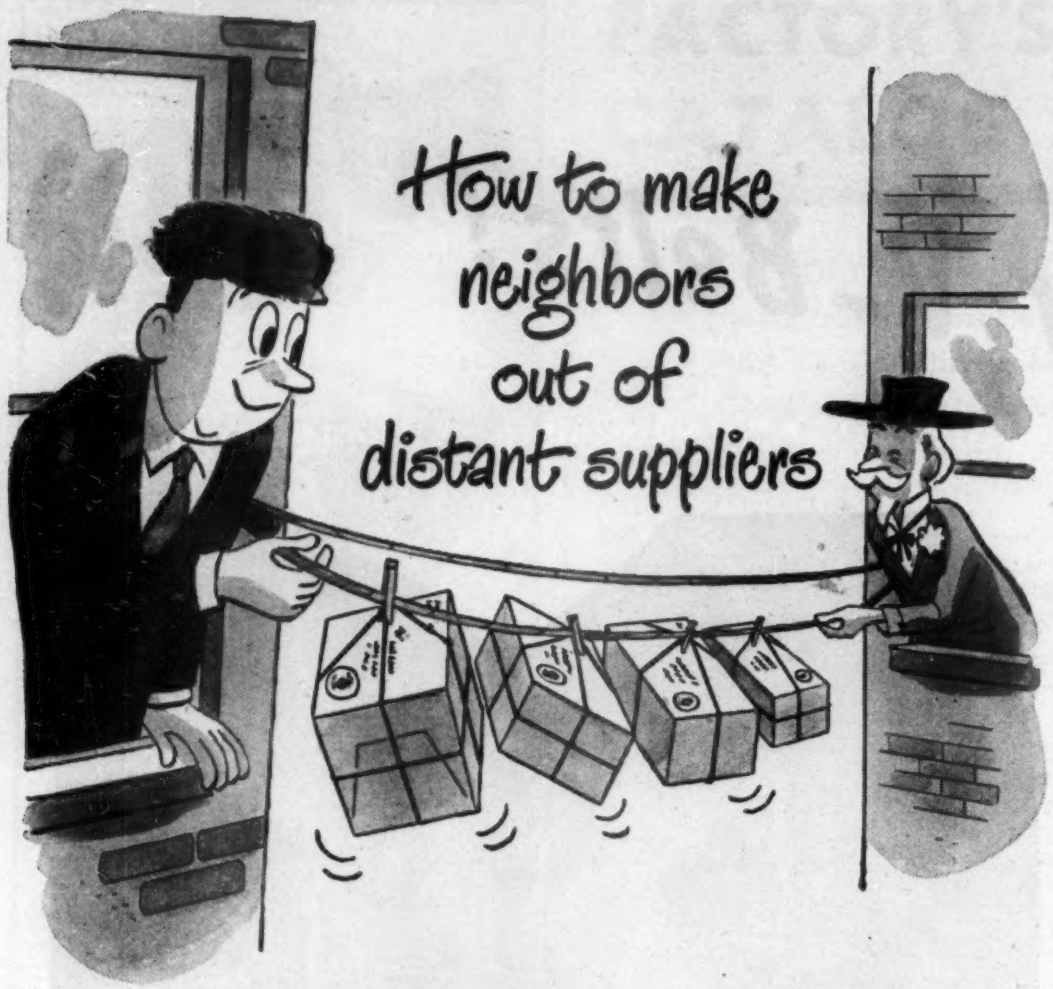

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use for particular jobs. Chicago Saw Works.

11

CONTOUR SAWING—Revised 416-page manual describes techniques for contour sawing and filing; also high-speed sawing and the friction cutting methods with band sawing equipment. Includes a self-training course, with 23 work projects, demonstrations, and grading tables. Contains photographs, charts, and drawings. The DoAll Co.

12

CONVEYOR BELTS—of woven wire are set forth in 56-page manual. Discusses design, construction, operation, and maintenance of the belts. Explains the different materials used for varying conditions of temperature and chemical attack, and the methods employed in weaving. The Cambridge Wire Cloth Co.

13

CONVEYORS, HEATERS, COOLERS—and other electric vibrating process equipment is set forth in 51-page Catalog 804. Explains details of construction, operation, functions, specifications, sizes, and capacities. The Jeffrey Mfg Co.

14

COUPLING—Bulletin A-410, 8 pages, contains details on the Taper-Lock flexible coupling. Exploded view shows structure of components, and ratings, sizes, prices, and other data are listed. Dodge Mfg Corp.

15

CRANE CONTROL—for overhead a.c. cranes, is set forth in 6-page Bulletin C-39. Hoisting and lowering curves are given, and design and operation are discussed. Harnischfeger Corp.

16

CYLINDERS—**16(a)** Bulletin A-105, 8 pages, supplies information on air cylinders from 1½- to 14-in bores. Includes mounting dimensions, installation drawings, thrust tables, and other data. **16(b)** Eight-page Bulletin H-104 deals with 2000-p.s.i. hydraulic cylinders. Contains cutaway view, construction details, and other features. Miller Motor Co

17

FLOOR REPAIRING MATERIAL—called Resurfacer, for repairs and overlays to concrete and wood floors, is the topic of floor maintenance guide. Typical installations are illustrated, and characteristics of the material are discussed. Stonhard Co.

18

FORK TRUCK—Six-page bulletin illustrates and describes electric Palletier Model MGVH in 3000- and 4000-lb. capacities. Includes charts of load lengths, dimensional drawings, and specifications. Crescent Truck Co.

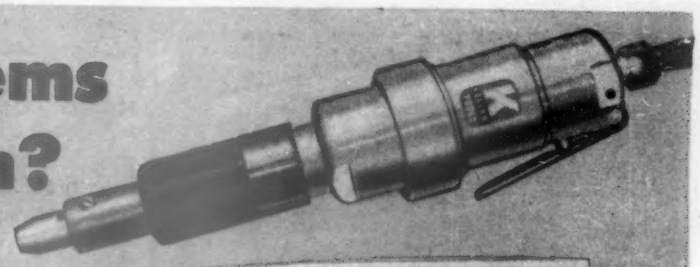
19

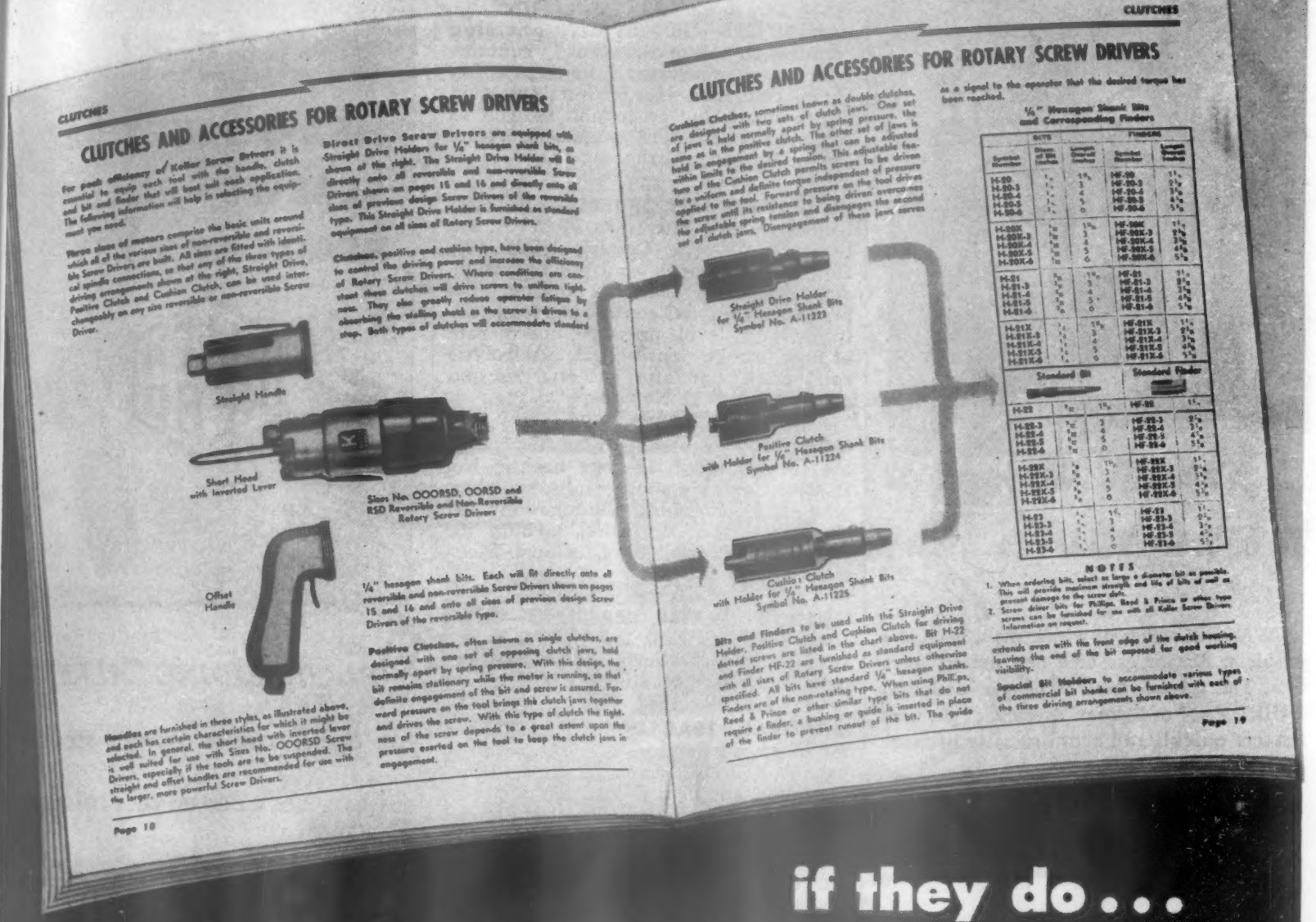
GAGES—**19(a)** Bulletin 171 describes plastic tube manometers for determining velocity and static pressures, for leakage, fan, and blower tests, and for resistance through filters. **19(b)** Air filter gages are featured in Bulletin 187. **19(c)** Portable and stationary gages, for measuring draft, air velocity, and slight pressure fluctuations, are outlined in Bulletin 205. **19(d)** Bulletin 165 gives formulas in connection with air flow data and gage readings with the pitot tube. F. W. Dwyer Mfg. Co.

20

GRAVITY AND POWER CONVEYORS—Bulletin 61, 16 pages, contains selection details on roller, wheel, and belt conveyors, portable piling machines, and other equipment. Includes photographs,

Do screw driving problems slow up your production?





CLUTCHES

CLUTCHES AND ACCESSORIES FOR ROTARY SCREW DRIVERS

For peak efficiency of Keller Screw Drivers it is essential to equip each tool with the handle, clutch and bit and finder that will best suit each application. The following information will help in selecting the equipment you need.

Three sizes of motors comprise the basic units around which all of the various sizes of non-reversible and reversible Screw Drivers are built. All sizes are fitted with identical spindle connections, so that any of the three types of driving arrangements shown at the right, Straight Drive, Positive Clutch and Cushion Clutch, can be used interchangeably on any size reversible or non-reversible Screw Driver.

Direct Drive Screw Drivers are equipped with Straight Drive Holders for ¼" hexagon shank bits, as shown at the right. The Straight Drive Holder will fit directly onto all reversible and non-reversible Screw Drivers shown on pages 15 and 16 and directly onto all sizes of previous design Screw Drivers of the reversible type. This Straight Drive Holder is furnished as standard equipment on all sizes of Rotary Screw Drivers.

Clutches, positive and cushion type, have been designed to control the driving power and increase the efficiency of Rotary Screw Drivers. Where conditions are constant these clutches will drive screws to uniform tightness. They also greatly reduce operator fatigue by absorbing the stalling shock as the screw is driven to a stop. Both types of clutches will accommodate standard ¼" hexagon shank bits. Each will fit directly onto all reversible and non-reversible Screw Drivers shown on pages 15 and 16 and onto all sizes of previous design Screw Drivers of the reversible type.

Straight Handle

Short Head with Inverted Lever

Sizes No. OOORSD, OORSD and RSD Reversible and Non-Reversible Rotary Screw Drivers

Offset Handle

Handles are furnished in three styles, as illustrated above, and each has certain characteristics for which it might be selected. In general, the short head with inverted lever is well suited for use with Sizes No. OOORSD Screw Drivers, especially if the tools are to be suspended. The straight and offset handles are recommended for use with the larger, more powerful Screw Drivers.

Positive Clutches, often known as single clutches, are designed with one set of opposing clutch jaws, held normally apart by spring pressure. With this design, the bit remains stationary while the motor is running, so that definite engagement of the bit and screw is assured. Forward pressure on the tool brings the clutch jaws together and drives the screw. With this type of clutch the tightness of the screw depends to a great extent upon the pressure exerted on the tool to keep the clutch jaws in engagement.

CLUTCHES AND ACCESSORIES FOR ROTARY SCREW DRIVERS

Cushion Clutches, sometimes known as double clutches, are designed with two sets of clutch jaws. One set of jaws is held normally apart by spring pressure, the same as in the positive clutch. The other set of jaws is held in engagement by a spring that can be adjusted within limits to the desired tension. This adjustable feature of the Cushion Clutch permits screws to be driven to a uniform and definite torque independent of pressure applied to the tool. Forward pressure on the tool drives the screw until its resistance to being driven overcomes the adjustable spring tension and disengages the second set of clutch jaws. Disengagement of these jaws serves as a signal to the operator that the desired torque has been reached.

Straight Drive Holder for ¼" Hexagon Shank Bits Symbol No. A-11223

Positive Clutch with Holder for ¼" Hexagon Shank Bits Symbol No. A-11224

Cushion Clutch with Holder for ¼" Hexagon Shank Bits Symbol No. A-11225

Bits and Finders to be used with the Straight Drive Holder, Positive Clutch and Cushion Clutch for driving slotted screws are listed in the chart above. Bit H-22 and Finder HF-22 are furnished as standard equipment with all sizes of Rotary Screw Drivers unless otherwise specified. All bits have standard ¼" hexagon shanks. Finders are of the non-rotating type. When using Phillips, Reed & Prince or other similar type bits that do not require a finder, a bushing or guide is inserted in place of the finder to prevent runout of the bit. The guide extends even with the front edge of the clutch housing, leaving the end of the bit exposed for good working visibility.

Special Bit Holders to accommodate various types of commercial bit shanks can be furnished with each of the three driving arrangements shown above.

¼" Hexagon Shank Bits and Corresponding Finders

Bits			Finders	
Symbol Number	Diam. of Bit Inches	Length Overall Inches	Symbol Number	Length Overall Inches
H-00	1/4	1 5/8	HF-00	1 1/4
H-00-3	1/4	3	HF-00-3	2 3/4
H-00-4	1/4	4	HF-00-4	3 3/4
H-00-5	1/4	5	HF-00-5	4 3/4
H-00-6	1/4	6	HF-00-6	5 3/4
H-00X	1/4	1 5/8	HF-00X	1 1/4
H-00X-3	1/4	3	HF-00X-3	2 3/4
H-00X-4	1/4	4	HF-00X-4	3 3/4
H-00X-5	1/4	5	HF-00X-5	4 3/4
H-00X-6	1/4	6	HF-00X-6	5 3/4
H-01	5/16	1 5/8	HF-01	1 1/4
H-01-3	5/16	3	HF-01-3	2 3/4
H-01-4	5/16	4	HF-01-4	3 3/4
H-01-5	5/16	5	HF-01-5	4 3/4
H-01-6	5/16	6	HF-01-6	5 3/4
H-01X	5/16	1 5/8	HF-01X	1 1/4
H-01X-3	5/16	3	HF-01X-3	2 3/4
H-01X-4	5/16	4	HF-01X-4	3 3/4
H-01X-5	5/16	5	HF-01X-5	4 3/4
H-01X-6	5/16	6	HF-01X-6	5 3/4
Standard Bit			Standard Finder	
H-02	3/8	1 5/8	HF-02	1 1/4
H-02-3	3/8	3	HF-02-3	2 3/4
H-02-4	3/8	4	HF-02-4	3 3/4
H-02-5	3/8	5	HF-02-5	4 3/4
H-02-6	3/8	6	HF-02-6	5 3/4
H-02X	3/8	1 5/8	HF-02X	1 1/4
H-02X-3	3/8	3	HF-02X-3	2 3/4
H-02X-4	3/8	4	HF-02X-4	3 3/4
H-02X-5	3/8	5	HF-02X-5	4 3/4
H-02X-6	3/8	6	HF-02X-6	5 3/4
H-03	7/16	1 5/8	HF-03	1 1/4
H-03-3	7/16	3	HF-03-3	2 3/4
H-03-4	7/16	4	HF-03-4	3 3/4
H-03-5	7/16	5	HF-03-5	4 3/4
H-03-6	7/16	6	HF-03-6	5 3/4

NOTES

1. When ordering bits, select as large a diameter bit as possible. This will provide maximum strength and life of bit or nut as well as prevent damage to the screw slot.
2. Screw driver bits for Phillips, Reed & Prince or other type screws can be furnished for use with all Keller Screw Drivers. Information on request.

if they do . . .

YOU WILL FIND THIS CATALOG WORTH ITS WEIGHT IN GOLD

Many manufacturers have this catalog. It is packed with information on how to get the most out of pneumatic tools. You are urged to take advantage of the wide range application low inventory requirements it recommends. If you do not have one you are invited to write for it . . . use the coupon as a reminder.

On the two pages illustrated above you will find the data you need on the handle type, clutches and accessories available for each driving operation . . . and how the parts are interchangeable. A similar section is devoted to the same information on nut setters. Yes . . . Catalog No. 12 is more than a catalog . . . it's a "how-to-use manual!"

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dimensional drawings, and specifications. Standard Conveyor Co.

21

HAND TOOL—called Tempotool, which employs the power of an exploding powder charge to drive a holding stud into steel, concrete, or masonry, is the topic of 4-page folder. Describes and illustrates action step by step, and sectional drawing shows design. Tempo Products Co.

22

HUMIDIFIERS—Bulletin 177, entitled "Controlled Humidification," contains information on steam humidifiers. Includes reference data on humidification requirements for processing as well as for storing different materials. Armstrong Machine Works.

23

INDICATING RECORDERS—and controllers, named Micromax Model R, are listed in 16-page Catalog ND44 (2). Describes functions, controls, operation, and installation. Contains data on units for measuring and controlling temperature, liquid level, pressure, speed, rate of flow, smoke density, pH, electrolytic conductivity, and for gas analysis and control. Leeds & Northrup Co.

24

LIGHTING—Recessed troffer luminaires are introduced in 12-page booklet No. B-3959. Contains photographs, sketches, schematic diagrams, illumination design data, and suggested layouts for various conditions. Westinghouse Electric Corp.

25

MASONRY WATER REPELLENT—called Rainchek, for walls and floors, is the subject of 4-page Form RC847. Explains uses. Protection Products Mfg. Co.

26

MONORAIL TRACTOR—named Trojan, for overhead hauling, is the topic of 4-page Bulletin 810. Explains construction, operation, and uses. Dimension diagrams and pictures supplement text. Detroit Hoist & Machine Co.

27

MOTORS—Four-page Bulletin 211 deals with synchronous motors from 10 to 1000 horsepower. Describes and illustrates stator, rotor, control, bearings, and structure. The Electric Products Co.

28

OIL VALVE—for oil burners is introduced in 4-page Bulletin 707. The hand wheel, lever and automatic control types of the metering unit are covered. Hauck Mfg. Co.

29

PALLETS—Eight-page brochure deals with wooden pallets. Outlines construction, size, uses, and capacities. National Pallet Corp.

30

PALLETS—"Pallet Buyers and Engineers Guide," a 24-page booklet, contains details on selection of the proper size and type of pallet for the job. Sets forth specifications and construction data on hardwood pallets. Pallet Sales Corp.

31

PHOTOCOPYING MACHINE—called Tru-Copy-Photo, with automatic timer, for use as a contact or reflex printer, is featured in catalog. General Photo Products Co.

32

PLATFORM SCALE—Bulletin P714C, 16 pages, describes the Load King Dormant platform scale. Charts give scale dimensions, platform sizes, scale capacities, dial graduations, and other data. Con-

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for applications where steel is subject to excessive moisture, chemical fumes or corrosive vapors. Made of "18-8 Type" *Stainless,* non-heat treated, non-magnetic. Set screws: stock sizes #6 to ½" diameter; cap screws: #8 to ½". N.C. threads only. Class 3 fit; Allen precision fastenings. . . Order of your local Allen Distributor, or write us for samples and literature.

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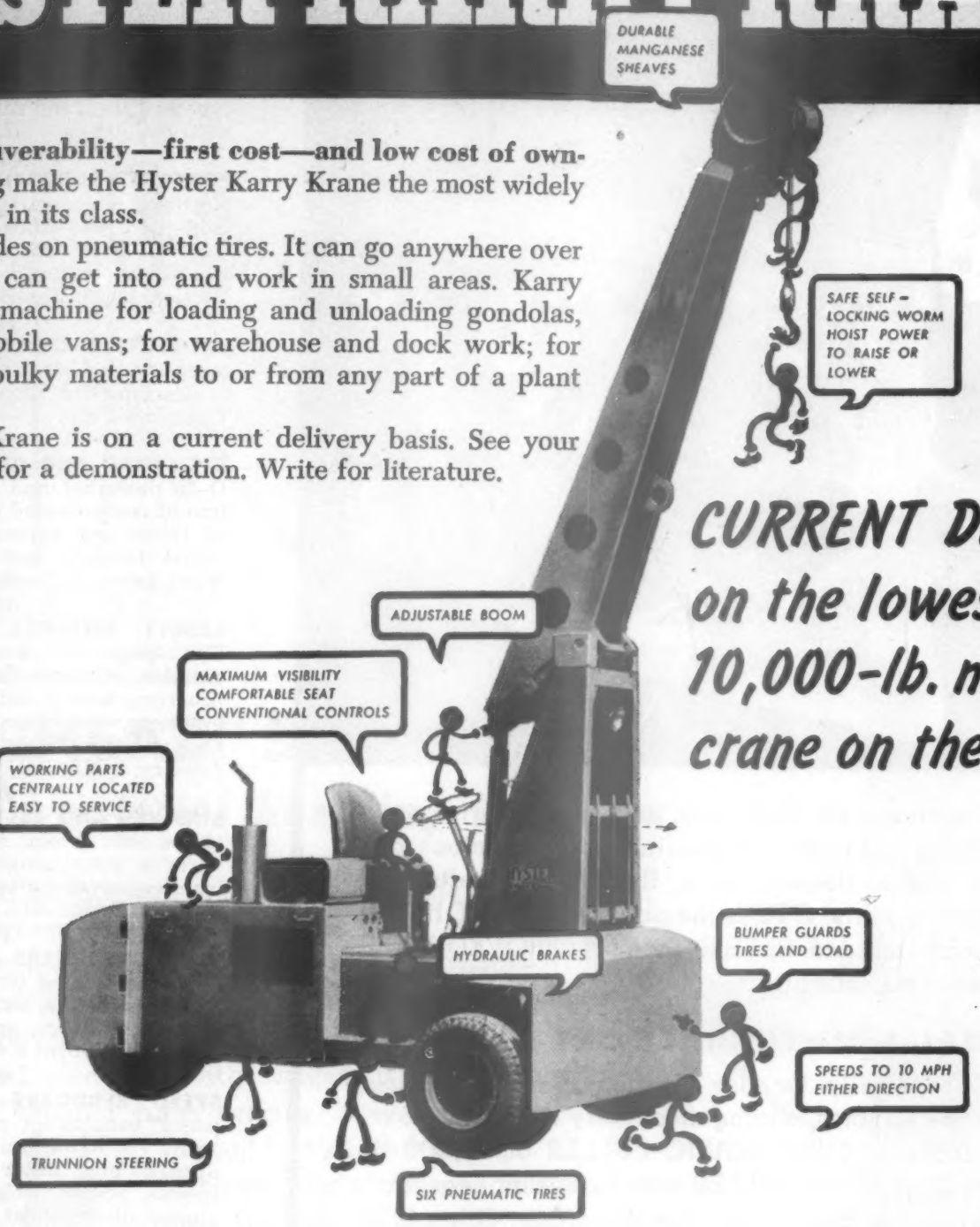
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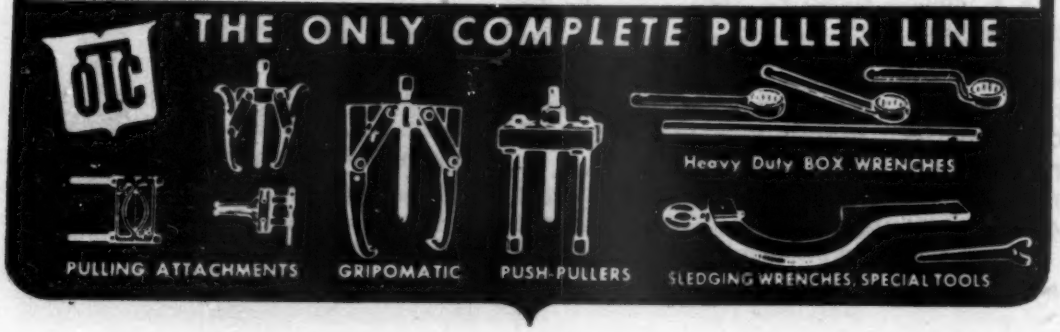

struction and selection data are included. Yale & Towne Mfg. Co.

33

POWER TRANSMISSION UNITS—including gears, speed reducers, motor reducers, couplings, high speed drives, and other equipment, are discussed in 12-page Bulletin 10,000. Contains data on types, ratings, and ranges, supplemented with photographs. The Falk Corp.

34

PROTECTIVE CLOTHING—Rubber and Koroseal clothing, including rain coats, acid-proof and other aprons, sleeve protectors, work suits, coats, hats, and gloves, are featured in 12-page Catalog Section 12000. The B. F. Goodrich Co.

35

PROTECTIVE COATING—for concrete, masonry, and steel, wet or dry surfaces, is described in illustrated leaflet. Sika Chemical Corp.

36

RESISTORS AND RHEOSTATS—Catalog D-30 describes and illustrates Vitrohm line of resistors and rheostats in a range of types and values. Includes dimensional data and basic resistor formulas. Ward Leonard Electric Co.

37

SAFETY EMBLEMS AND AWARDS—Eight-page circular shows, through presentation of items listed, various safety programs used in industry. Covers safety emblems, trophies, plaques, memorial tablets, and safety awards. Williams Jewelry & Mfg. Co.

38

SHEAVES AND BELTS—Illustrated brochure lists prices, ranges, and sizes of variable pitch, single groove, and cast-iron fractional-horsepower sheaves, and V-belts. Dodge Mfg. Corp.

39

SPEED REDUCERS—Catalog 300 tells about Speedaire worm gear speed reducers with fan cooling. Contains data on types, ratings, and installations. The Cleveland Worm & Gear Co.

40

SPEED REDUCERS—Catalog 65-47, 36 pages, consists of engineering data on worm reduction units, single helical reducers, and miter gear units. Lists speeds, power, weight, and prices. Includes dimensional diagrams and pictures of each unit. Grant Gear Works.

41

STEAM BOILER—**41(a)** Designated Speedylectric, a portable, high pressure electrode steam boiler is introduced in Bulletin 32. Contains information on working pressures, temperatures, and capacity ratings, operating description, and engineering information. **41(b)** Bulletin 33 contains ordering data and price list. **41(c)** Bulletin 34 deals with Series 400 portable, electric high pressure steam boiler operating on regular lighting circuits. Livingstone Eng. Co.

42

STEAM CLEANER—Hypressure Jenny Model JO steam cleaner is featured in illustrated circular. Explains unit construction, capacity, control, oil or gas burning units, pumps, motor, and other components. Homestead Valve Mfg. Co.

43

STEPLADDERS—of aluminum are featured in 4-page folder. Includes pictures of folding and extension ladders. Steplight Sales Co.

44

THERMOCOUPLES—as well as protection tubes, and pyrometer accessories are covered in Bulletin P1235. Contains

WRIGHT

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